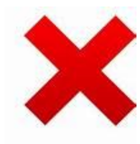
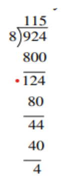
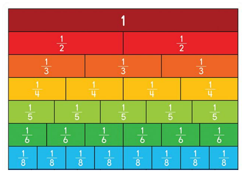
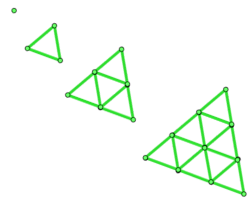
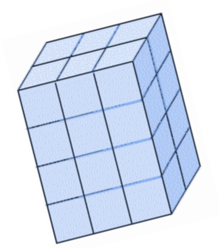
LET US UNDERSTAND MATHEMATICS-CLASS 5

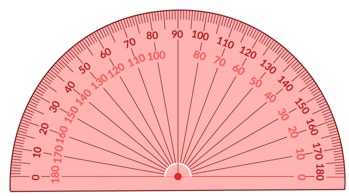


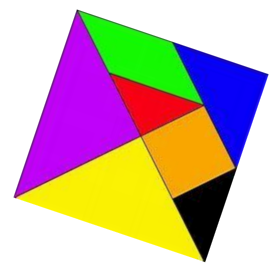


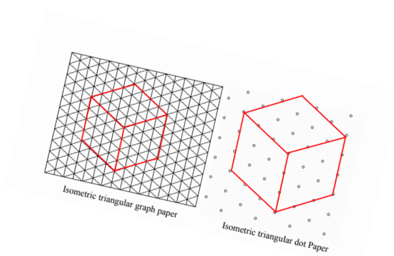


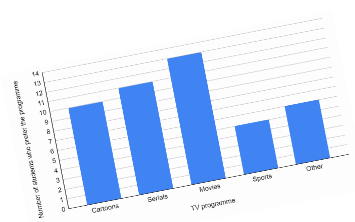












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PREFACE

This is part of a revised series of books based on research on the teaching of mathematics for class 5 in India earlier published on www.vidyaonline.net. This covers the NCERT syllabus for class 5 and most of the common core state standards for class 4 in the US.

The book emphasises an understanding of concepts and procedures important for problem solving and further learning in mathematics. Concepts and procedures are presented by manipulatives, pictures, real-world situations, written words, symbols and videos. Opportunities are provided for applications of mathematics to real-world situations, reasoning, communication, translation from one mode to another, and problem-solving.

The schools or students that can afford materials such as geometrical models, tangrams, pattern blocks, fraction pieces, clocks, and scissors should buy them. If not, teachers and/or students can make them.

Some activity sheets are provided that can be removed and used.

Answers to selected exercises are given.

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UNIT 1

Numbers

Watch the video: https://youtu.be/T5Qf0qSSJFI

Review of Numbers

The Hindu Arabic numeration system is based on base ten. In this system, any number however large can be written using digits 0-9 by using the concept of place value and zero as a placeholder. The numbers increase by one, after 9 instead of adding a new symbol for the next number; we add a place to its left and give it a name-tens place. All two-digit numbers up to 99 can be written using these places. We add another place for the number next to 99, which is called the hundreds place. All numbers from 100 to 999 can be written using these three places. We can continue in this manner adding a place to the left of the existing places after all the digits in a number are 9 and giving it a name for extending the numbers system to as many places as we like.
We add commas between certain places in a number to make it easier to read.
Before extending it to the left after 999, in India we add a comma before hundreds and give a new name a **thousand** and henceforth we add a comma before next two numbers when extending it to the left and give a new name e.g. after 9,999-ten thousand, after 99,999- **lakh**, after 9,99,999-ten lakh, after 99,999-**crore** and so on.
In other countries a comma is added before the next three numbers extending it to the left and a new name is given e.g, **million**, after 999,999, then ten million, hundred million, a **billion** after 999,999,999, and so on.
1 million = 10 lakh.
In this book, we will use Indian system of numeration only.
Any place always has a place value ten times the place value of the place value of the digit to its right.
The place values of digits of several numbers in the first column are given in the corresponding row.

			Place Value				
Number	Ten lakhs	Lakh	Ten thousand	Thousand	Hundred	Tens	Ones
6							6
59						5	9
563					5	6	3
4,708				4	7	0	8
92,390			9	2	3	9	0
73,006			7	3	0	0	6
3,06,256		3	0	6	2	5	6
1,00,453		1	0	0	4	5	3
71,45,372	7	1	4	5	3	7	2

A number is the sum of values of all digits multiplied by its place value. For example,
$92{,}390 = 9 \times 10{,}000 + 2 \times 1000 + 3 \times 100 + 9 \times 10 + 0 \times 10$
We can also write it as
92,390 = 9 ten thousands+2 thousands+3 hundreds+2 tens +0 ones
92,390 = 90,000 + 2,000 + 300 + 90 + 0
This is called an **expanded** form of the number 92,390
We read numbers beginning with the digit at the left. For example, we read

380 - Three hundred eighty
4,004 - Four thousand four
50,603 - Fifty thousand six hundred three
17,00,500 - Seventeen lakh five hundred

Comparison of numbers

The digits in different places have different values.
We can compare numbers by looking at the number of digits and the value of the digits.
If the number of digits is different in the two numbers, the number with larger number of digits is greater than the one that has fewer digits. For example, 45 > 8, 674 > 89, 5234 > 687, 25,781 > 8,629, 1,67,903 > 98,528.
If the two numbers have the same number of digits, we first look at the digit in the place with the highest place value in the two numbers. If these are different, then the number in which this digit is larger is greater than the number in which the digit in that place is smaller. For example 456 > 278, 7835 > 6835, 56,982 > 40,789, 4,56,891 > 2,89,461, 2,89,461 < 56,891.
If the digit in the leftmost place is the same in both numbers, then we compare the digits in the next place. If these are different, the number in which the digit in this place is larger is greater than the number in which the digit in this place is smaller. For example, 247 > 228, 7478 > 7259, 45,789 > 42,986.
If the digit in the leftmost place, as well as the place next to it, are the same in both numbers, then we compare the digits in the next place. If these are different, the number in which digit in that place is larger is greater than the number in which digit in that place is smaller, for example, 783 > 782, 9437 > 9,419, 56,984 > 56,789.
If a number of digits are the same in more than two places beginning from the left, we continue examining in this manner the next digits until one's place.
If the number of digits and digits in all places are the same in both the numbers, then the two numbers are equal, for example, 658 = 658, 7,495 = 7,495, 23,467 = 23,467.

Exercise 1.1

1. Read the following numbers:
   467; 703; 1,274; 1,000; 14,667; 21,089; 4,005; 20,053; 1,42,735; 20,07,859.
2. Make a place value chart and write the numbers in the chart (to be dictated by the teacher).
   (a) 3,765 (b) 3,089 (c) 4,008 (d) 24,578 (e) 40,765 (f) 2,03,701
   (g) 44,067 (h) 3,60,002 (i) 2,30,030 (j) 12,
3. Write the following numbers in figures:
   (a) Six thousand
   (b) Eight thousand three hundred sixty-four
   (c) Forty-three thousand seven hundred fifty-seven
   (d) Nine thousand nine
   (e) Two lakh seventy-five thousand four hundred sixty-two
   (f) Two thousand four hundred six
   (g) Two lakh eighty thousand six
   (h) Seven thousand eighty-five
   (i) Twenty four thousand one
   (j) One thousand seven hundred eight
4. Write the following numbers in words:
   (a) 3,867 (b) 1,803 (c) 4,002 (d) 12,894 (e) 29,004
   (f) 1,26,009 (g) 8,056 (h) 41,090 (i) 27,052 (j) 1,74,005
5. What comes just after the following numbers?
   (a) 1,019 (b) 26,734 (c) 9999 (d) 99,999 (e) 1,999
6. What comes just before the following numbers?
   (a) 500 (b) 4,680 (c) 12,000 (d) 23,260 (e) 2,74,70
7. Write the largest five-digit number
8. Write the smallest 4-digit number.
9. Write the numbers whose expanded forms are given below:
   (a) 4 thousands + 3 hundreds + 2 tens + 7 ones
   (b) 2 ten thousands + 8 thousands + 7 hundreds + 0 tens + 5 ones
   (c) 4 ten thousands +3 thousands + 0 hundreds + 4 tens + 0 ones
   (d) 1 ten thousand + 9 thousands + 5 hundreds + 0 tens + 6 ones
   (e) 2 thousands + 6 hundreds + 9 tens + 0 ones
10. Write the expanded forms of the numbers given below:
    (a) 6,952 (b) 18,478 (c) 25,089 (e) 14,002
11. Name the digit in the specified place for the numbers given below:
    (a) One's place for 1,980
    (b) Thousand's place for 6,871
    (c) Hundred's place for 58,453
    (d) Ten's place for 1,25,672
12. Write the place value of the red digit in the following numbers:
    (a) 6,387 (b) 18,654 (c) 2,483 (d) 17,469 (e) 28,462
    (f) 5,804 (g) 1,964 (h) 4,826 (i) 30,659 (j) 780

13. What is the value of digit 4 in each of the following numbers:
    (a) 4
    (b) 42
    (c) 420
    (d) 4200
    (e) 42000
    (f) What pattern do you notice in the place values of the above numbers?
14. I am a six-digit number. My 3 is worth 3,00,000; 5 is worth 50,000; 4 is worth 40; another 4 is worth 100 times as much; 3 is worth 3, and my other digit is worth 800. What number am I?
15. Write a number with 5 in thousand's place, 3 in lakh's place, 9 in hundreds place, 4 in ones place, and 2 in other places.
16. Compare the following numbers by writing >, <, or = between numbers:
    (a) 678 ____ 89
    (b) 2,457 ____793
    (c) 4,569 ____4,584
    (d) 78,952 ____63,763
    (e) 48,749 ____48,798
17. Arrange the following numbers from smallest to largest:
    (a) 25, 67 and 30
    (b) 462, 873 and 760
    (c) 546, 8,531 and 4,906
    (d) 4,785; 4,794 and 34,762
18. Arrange the following numbers from largest to smallest:
    (a) 58, 78 and 23
    (b) 567, 349 and 782
    (c) 9,432; 25,873 and 5,982
    (d) 67,413; 85,329 and 85,964
19. Write the largest 4-digit number using digits 4, 8, 5, and 2. Use each digit once only.
20. Write the smallest 5-digit number using digits 9, 4, 8, 5, and 2. Use each digit once only.
21. Write all 3-digit numbers using the digits 2, 4, and 9 using each digit once only.
22. Find examples of the use of large numbers in our daily lives and present them in class.

Watch the video: https://youtu.be/PT8gaSKrgtM

Rounding Numbers

We often need to round numbers as measures of those may not be available e.g. coins, measures of different attributes e.g. weights, or approximate results would do e.g. the population of a city or country.
We usually round to the nearest 10, 100, and 1000, ...As it is easy to calculate mentally with multiples of 10 which is useful for checking bills quickly and reasonableness of results while doing computations by a calculator.

Rounding to nearest 10

We first find two consecutive multiples of 10 between which the number lies. (Two numbers are consecutive if one number comes just after the other in counting e.g. 6,7; 45,46, 231,232.)
Then round it to the multiple of ten to which it is nearer(its difference from the multiple is smaller).

Example 1-Round 72 and 77 to nearest ten.
72, lies between 70 and 80. As it is nearer to 70 than 80, so we round it to 70.
77 lies between 70 and 80. As it is nearer to 80 than 70 so we round it to 80.
If a number lies midway between two numbers, the convention is to round it up to the larger number.

Example 2-Round 75 to nearest ten.
75 lies midway between 70 and 80, we round it to the higher number 80.

Round numbers with more digits to the nearest ten.

Find two consecutive tens in which a number lies, then round it to the nearest 10.

Example 3-Round 537 to the nearest ten.
537 lies between 530 and 540. It is nearer to 540 than 530, we round it to 540.

Round numbers to nearest 100

We look at two consecutive multiples of 100 between which the number lies and round it to the hundred to which it is nearer.

Example 4-Round 472 and 834 to the nearest hundred.
472 lies between 400 and 500. As it is nearer to 500 than 400 so we round it to 500.
834 lies between 800 and 900. As it is nearer to 800 than 900 so we round it to 800.
If a number lies midway between two numbers, we round it up to the larger hundred.

Example 5-Round 250 to the nearest hundred.
250 lies between 200 and 300. As it lies midway between 200 and 300, we round it to 300.

Round numbers with more digits to the nearest hundred

Example 6- Round 5,320 to the nearest hundred.
5,320 lies between 5,300 and 5,400, as it is nearer to 5,300, we round it to 5,300
Example 2- Round 56,789 to the nearest hundred.
56,789 lies between 56,700 and 56,800, as it is nearer to 56,800, we round it to 56,800.

Rounding to nearest 1000 We look at two consecutive multiples of 1000 between which the number lies and round it off to the thousand to which it is nearer.

Example 7-Round 2258 and 7864 to the nearest thousand.
2,258 lies between 2,000 and 3,000. As it is nearer to 2,000 than 3,000 so we round it to 2,000. 7,864 lies between 7,000 and 8,000, it is nearer to 8,000 than 7,000 so we round it to 8,000.
If a number lies midway between two numbers, we round it up to the larger number.

Example 8-Round 5500 to the nearest thousand.
5,500 lies midway between 5,000 and 6,000, we round it up as 6,000.
In general, we may round a number to nearest any multiple of ten by following steps given below:

1. Underline the digit in the place to which a number is to be rounded e.g. tens, hundreds.
2. Look at the digit in the place next to its right. If it is greater than or equal to 5, round the underlined digit to one more otherwise let it remain as it is and write 0s in the places to its right.

Example 9 Round 3,45,728 to the nearest thousand

1.Underline the digit in thousands place-3,4<u>5</u>,728.

2. As 7 the digit in next placs i.e. hundreds place is greater than 5, we round it to 6 and write 0s for the remaining places. Thus 3,45,728 rounded to nearest thousand is 3,46,000.

Exercise 1.2

1. Write the next numbers of the series given below:
   (a) 50, 60, 70, _____
   (b) 300, 400, 500, _____
   (c) 6,000; 7,000; 8,000; _____
   (d) 67,000; 68000; 69,000; _____
2. Write two consecutive multiples of tens between which the following numbers lie:
   (a) 34 lies between 30 and 40
   (b) 67 lies between.____ and _____
   (c) 167 lies between _____and _____
   (d) 2375 lies between _____and _____
3. Write two consecutive multiples of hundreds between which the following numbers lie:
   (a) 560 lies between 500 and 600
   (b) 1,682 lies between _____and _____
   (c) 11,723 lies between _____and _____
   (d) 86,550 lies between _____and _____
4. Write two consecutive multiples of thousands between which the following numbers lie:
   (a) 5,892 lies between 5000 and 6000
   (b) 7,351 lies between _____and _____
   (c) 4,23,405 lies between _____and _____
5. Encircle the correct number
   (a) 61 is nearer to 60 or 70.
   (b) 217 is nearer to 200 or 300.
   (c) 2,566 is nearer to 2,000 or 3,000.
   (d) 24,330 is nearer to 24,000 or 25,000.
6. Round the numbers given below to the nearest ten:
   (a) 62 (b) 145 (c) 1,275
7. Round the numbers given below to the nearest hundred:
   (a) 234 (b) 1450 (c) 2,677 (d) 56,235
8. Round the numbers given below to the nearest thousand:
   (a) 5,200 (b) 1,783 (c) 5,500 (d) 38,678
9. A number was rounded to the nearest ten as 70. What is the range of possible values for the original number?
10. A number was rounded to the nearest hundred as 400. What is the range of possible values for the original number?
11. A number was rounded to the nearest thousand as 6000. What is the range of possible values for the original number?

UNIT 2

Operations on Numbers

Multiplication

Watch the video: https://youtu.be/GKetIwxaenA

By now, you should be able to answer the multiplication of one-digit numbers(multiplication facts) instantly without thinking. Do the mastery test on multiplication given in Appendix 3. If you cannot recall some multiplication facts without starting the multiplication table of that number from one or other aids, memorize them.

In 6 × 8 = 48, 6 and 8 are called **factors** of 48. We also call 6, the **multiplicand,** and 8 the **multiplier**. The number 48 obtained by multiplication is called the **product**.

48 is also called **multiple** of 6 and 8.

Multiplication of a three-digit number by a three-digit number

Multiplication of a number by a three-digit number can be done by following the steps given below:

1. Multiply the number by ones
2. Multiply the number by tens
3. Multiply the number by hundreds
4. Add them.

Example 1

```
    538
  × 275
  --------
   2690          538 × 5
  37660          538 × 70
 107600          538 × 200
-----------
 147950          2690 + 37660 + 107600
-----------
```

Example 2

```
   726
 × 840
-----------
 29040          726 × 40
+580800         726 × 800
-----------
 609840         29040 + 580800

   694
 × 407
-----------
  4858          694 × 7
+277600         694× 400
-----------
 282458
```

We can similarly multiply larger numbers, by multiplying by thousands and so on.

Estimation of products

As the numbers get large, it becomes tedious to multiply by paper and pencil and one may use a calculator. However, one can make mistakes with the calculator also as you may press the wrong number. It is a good strategy to estimate the product of numbers by rounding the multiplicand and multiplier to the nearest 10, 100, ... depending on the number of digits in the number and multiplying these mentally. This would help us to find out whether the product given by the calculator is reasonable or not.

Example 3

Find an estimate of the product of 213 × 48 and check the reasonableness of the answer.

Rounding off 213 to nearest 100 and 48 to nearest 10, we get 200 and 50. Multiplying 200 and 50 gives the estimate of the product 10,000.

Whereas the exact value of 213 × 48 = 10,224 close to it.

Example 4

Find an estimate of the product of 670 × 523 and check the reasonableness of the answer.

Rounding off 670 and 523 to the nearest 100, we get 700 and 500. Multiplying 700 and 500 gives the estimate of the product 3,50,000.

Whereas 670 × 523 = 3,50,410 which is close to it.

Multiplication of three numbers

There are some situations where we need to multiply three numbers.

Example 5

A tray contains 12 eggs. If a carton holds 10 egg trays, how many eggs will 6 cartons have?

Here we first find how many eggs would one carton contain and then how many eggs would six cartons contain as follows:

1 carton will contain 12 × 10 = 120 eggs

6 cartons will contain 120 × 6 = 720 eggs

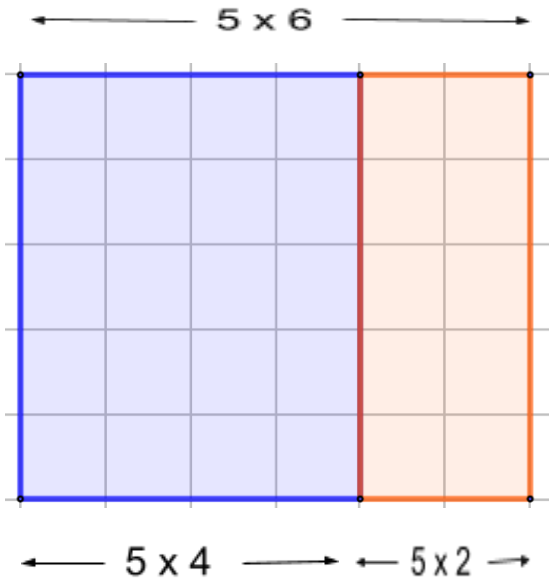
Properties of multiplication

- The order of numbers in a multiplication does not matter, e.g. 3 × 4 = 4 × 3 =12.
- We can multiply three numbers by first multiplying any two of them and then multiplying their product with the third number, e.g.

  (5 × 7) × 2 = 35 × 2 = 70

  (5 × 2)×7 = 10 × 7 = 70

  We use the parentheses ( ) to indicate which multiplication is to be carried out first.
  We can rearrange numbers so that they are easier to multiply mentally as in the example given above.
  As the grid given below shows, the product of a number and sum of two numbers is the same as the sum of the products of the number with the individual numbers e.g. 5 × 6 = 5 × (4 +2) = 5 × 4 + 5 × 2.



We can use this property also to decompose numbers so that they are easier to multiply mentally.
Example 6- Find 18×9
We can write it as 18× (10 − 1) = 180 - 9 =171.

Exercise 2.1

1. Fill in the blanks
   (a) 8 × 9 = ___
   (b) 7 × ___ = 7
   (c) 1× ___= 149
   (d) ___× 86 = 0
2. Fill in the blanks
   (a) 7 × 4 = 4 × ___
   (b) 5 × ___= 6 × 5
   (c) 6 × 8 × 2 = 48 ×___
   (d) 4 × 7 × 3 = 12 × ___
   (e) 2 × 6 × 5 = 10 × ___
   (f) 8 × (5 + 4) = 8 × 5 + 8 × ___
   (g) 9 × 8 = 9 × (2 +___)
   (h) 6 × (2 + 5) = 6 × (3 + ___)
3. Find the following products
   (a) 4 × 10
   (b) 3 × 100
   (c) 40 × 60
   (d) 70 × 100
   (e) 200 × 400
4. What relation do you notice between the number of zeros in the product and the number of zeros in the two numbers being multiplied in Q. 3?
5. If 56 × 78 = 43,368, find mentally 78 × 56
6. Use properties of multiplication to find an equivalent expression, so that you can do them mentally.
   (a) 5 × 83 × 2 (b) 21× 9 (c) 35×6 (d) 25 × 7 × 4
7. Write the term of the series given below:
   (a) 7, 14, 21, 28, ___
   (b) 1, 2, 4, 8, ___
   (c) 1, 4, 9, 16, ___
8. Estimate the product of the numbers given below and check if it is close to the exact answer.

(a) 23 × 58
(b) 42 × 97
(c) 31 × 102
(d) 293 × 302

9. Multiply the numbers given below:
(a) 348 × 483 (b) 785 × 657 (c) 679× 120 (d) 859 × 708
(e) 567 × 986 (f) 358 × 500 (g) 876 × 304 (h) 609 × 560

10. A chair costs Rs. 725 and a central table Rs 1250. If Sunita bought 4 chairs and a central table, how much money should she pay to the shopkeeper?

11. Rajan bought 18 roses each costing 6 rupees.
(a) How much money should he pay to the shopkeeper?
(b) If he paid 120 rupees to the shopkeeper, how much money should the shopkeeper return to him?

12. Apples cost Rs. 65 per kg. How much will be the cost of 8 kg?

13. A roll of cloth is 24 metres long. How many metres of cloth will be there in 5 rolls?

14. A carton contains 12 trays. If each tray has 24 eggs. How many eggs will be there in 10 cartons?

Division

Division by one-digit number

Do the mastery test on division given in Appendix 3. If you cannot recall some division facts, find those by using some aids such as a multiplication table and memorize them.

Suppose you have 28 stamps and you want to divide them equally among 4 friends. How many stamps can you give to each?

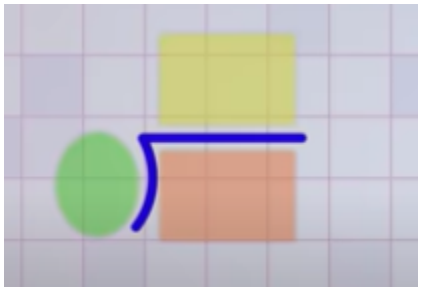
We know from division facts $28 \div 4 = 7$, so we can give 7 stamps to each.

But you cannot do all division problems using division facts even for division by one-digit numbers.

Now suppose you want to divide 28 stamps equally among 5 friends. Then how many stamps can you give to each?

Now after you have given 5 to each, 25 have been used up and 3 are left.

For the division of such numbers instead of the division symbol ÷ we use



In the space coloured pink, we write the number that is to be divided and is called the **dividend,** in the space coloured green we write the number by which the number is to be divided called the **divisor**, and in the yellow space we write the answer which is called the **quotient** and the number left over after the division is called the **remainder** and sometimes is written in the space for the quotient after writing R/r there.

The remainder must always be less than the divisor.

Example 6:

Divide 28 by 5.

$$
\begin{array}{r}
5 \\
5\overline{)28} \\
25 \\
\hline
3
\end{array}
$$

To divide 28 by 5,we carry out the following steps:

1. Write 28 in the place for dividend and write 5 in the place for the divisor.
2. Find the highest multiple of 5 which is less than 28. As it is 5, write 5 in one's place in the place for the quotient.
3. Multiply the divisor by 5. As $5 \times 5 = 25$, we write 25 below 28.
4. Subtract 25 from 28.
5. Check if the remainder is less than the divisor. As $3 < 5$, the remainder is 3

We can verify the answer to a division problem by the relation:

Dividend = Divisor ×Quotient + Remainder

In the above example 5 ×5 + 3 = 28, the same as the dividend.

Division of two or more digit numbers by a one-digit number

Watch the video: https://youtu.be/LGqBQrUYua4

Example 7-Divide 853 by 6.

The teacher can explain the procedure using fake money or asking a series of questions given below:
Suppose you want to divide 853 rupees among 6 persons equally and you have 8 hundred-rupee notes, 5 ten-rupee notes and 3 one-rupee notes.

1. How many hundred-rupee notes can you give to each?-1
2. You are left with how many hundred-rupee notes. (2)
3. How many ten-rupee notes can you get for those? (20)
4. How many ten-rupee notes do you have now? (20+5=25)
5. How many ten-rupee notes can you give to each? (4)
6. How many ten-rupee notes are left? (1)
7. How many one-rupee notes can you get for those? (10)
   How many one-rupee notes do you have now? (10+3=13)
8. How many one-rupee notes can you give to each? (2)
   How many one-rupee notes are left? (1).
9. How much money did each person get? (Rs.(1×100 + 4×10 + 2×1= Rs. 142))
10. How much money was left? (Rs 1)

The teacher can then explain the procedure for division pointing out the analogy with money for each step.

$$
\begin{array}{r}
142 \\
6\overline{)853} \\
6 \\
\hline
25 \\
24 \\
\hline
13 \\
12 \\
\hline
1
\end{array}
$$

1. Write 853 in the place for dividend and write 6 in the place for the divisor.
2. Look at the hundred's place and find a multiple of 6 which is less than 8. As it is 1, we write 1 in hundred's place in the place for quotient.
3. Multiply the divisor by 1. As 6×1 = 6, we write 6 below 8 and subtract 6 from 8 which gives 2.
4. Then we bring the next digit down that makes it 25 and find the highest multiple 6 that is less than 25. As this is 4, we write 4 in the ten's place in the quotient.
5. Multiply the divisor by 4. As 6×4 = 24, we write 24 below 25 and subtract 24 from 25 which gives 1.
6. Bring the next digit down that makes it 13 and find the highest multiple 6 that is less than 13. As this is 2, we write 2 in the one's place in the quotient.
7. Multiply the divisor by 2. As 6×2 = 12, we write 12 below 13 and subtract 12 from 13 which gives 1.
8. As all the digits have been brought down, it gives the remainder.
   The remainder = 1

We can verify it by checking if 142 ×6 + 1 = 853.

```
  2 1
  1 4 2
  ×   6
  --------
  8 5 2
    + 1
   --------
  8 5 3
```

We can similarly divide more than 3-digit numbers by a 1-digit number by following the steps given below:

1. To divide a number by a one-digit number, 1, we first look at the digit with the highest place value e.g. thousands for a 4-digit number.
2. If the number of thousands is greater than the divisor, find the highest multiple of the divisor less than the number of thousands. If the divisor is greater than the first digit, then find it for the first two digits.
3. Write the multiple in the space for the quotient in thousand's place if the number of thousands was greater than or equal to the divisor, otherwise in hundred's place.
4. Multiply the multiple with the divisor and write the product below the dividend, subtract it from that and write the difference below that.
5. Then bring the next digit in the dividend down and go on repeating steps 2 and 3 until you have brought all the digits have been brought down.
6. **At any stage if the number is less than the divisor, write 0 in the quotient for its place and bring the next digit down.**

Division of a number by a two-digit number

Watch the video: https://youtu.be/HdU_rf7eMTI

It is similar to dividing a number by a one-digit number except that we cannot use division facts and it would be very time consuming to find the greatest multiples less than the number of hundreds, tens, or ones to find the quotients in hundreds, tens and ones place.

We can do it informally by subtraction of easy multiples of the divisor till the remainder is less than the divisor. The quotient is equal to the sum of all multiples.

Example 8: Divide 96 by 23.

```
23)96
   23      23 × 1
   --
   73
   23      23 × 1
   --
   50
   23      23 × 1
   --
   27
   23
   --      23 × 1
    4
```

The quotient = 1+1+1+1=4 and the remainder = 4.
We can verify if our answer is correct by checking whether Dividend = Quotient×Divisor + Remainder or not.
4 ×23 + 4 = 92 + 4 = 96.

Example 9

Divide 643 by 28

```
28)643
   280      28 × 10
   ---
   363
   280      28 × 10
   ---
    83
    28      28 × 1
    --
    55
    28      28 × 1
    --
    27
```

The quotient = 10+10+1+1=22 and remainder =27
We can verify the answer by checking if 28×22 + 27 = 643.

Short algorithm We can also find the digits in different places in the quotient by following the procedure given below.

Two-digit dividend

1. Round off the dividend and the divisor to the nearest tens.
2. We can now divide these using multiplication facts to estimate the digit in one's place. For example, to divide 64 by 21, we round off these to 6 tens and 2 tens, this gives the estimate of the digit in one's place as 3.
3. We next multiply the estimate by the divisor and check if the product of the divisor and estimate is less than the dividend then subtract the product from the dividend. If the product of the divisor and estimate is greater than the dividend, revise the estimate downward and check again.
   In our example as 21 × 3 = 63 < 64, we subtract the product from the dividend to find the difference.

4. If the difference is less than the divisor, then the difference gives the remainder. If the difference is greater than the divisor, then we need to revise the estimate of multiple upwards.
   As 64 – 63 = 1 < 21. Therefore, 3 is the correct quotient and 1 is the remainder.

Division of a Three-digit number by a two-digit number

Example 10

Divide 464 by 28.

$$\begin{array}{r} 16 \\ 28\overline{)464} \\ 28 \\ \hline 184 \\ 164 \\ \hline 20 \end{array}$$

1. We first look at the first two digits of the dividend and round them to the nearest tens, and also round off the divisor to the nearest tens. This gives 5 and 3.
2. We then divide these to get an estimate of the digit in ten's place. For example, to divide 464 by 28, we round off 46 to 5 tens and 28 to 3 tens and divide these, this gives the estimate of the digit in ten's place as 1.
3. We next multiply the estimate by the divisor and check if the product of the divisor and estimate is less than the dividend. In this example $28 \times 1 = 28 < 46$.
4. Subtract 28 from 46 and check if the remainder is less than the divisor.
5. As $18 < 28$, we bring the next digit 4 down which gives 184 ones.
6. Estimate the digit in one's place by rounding off 184 to the nearest ten that is 18 tens and divide it by the 3 tens to estimate the digit in one's place which is 6.
7. We next multiply the estimate by the divisor and check if the product of the divisor and estimate is less than 184. $28 \times 6 = 164 < 184$.
   As $164 < 184$
8. Subtract the product from the dividend to get the remainder
   $184 - 164 = 20$, as it is less than the divisor. The remainder is 20.

Check at each stage if the product of multiple and divisor is less than the number from which it is to be subtracted, if not, revise the multiple to a lower value.

Also check at each stage that the remainder is less than the divisor. If not, revise the multiple to a higher value.

Applications of Division in daily life

There are many situations in daily life where we need to use division.

Can you give some examples?

What to do with the remainder in Word Problems

In many division word problems, we need to round the remainder up or down or report it as a fraction.

Example 11-Suppose your school is planning a trip for you to a zoo/mela and they need to hire minivans for that. How many vans are needed for 200 students, if a minivan can accommodate a maximum of 12 children?

When we divide 200 by 16, we get 12 as a quotient with 8 as a remainder. We cannot leave 8 children, so we need to round the quotient up and our answer will be 13 minivans.

Example 12-Suppose you have 50 rupees and a notebook costs 6 rupees. What is the maximum number of notebooks you can buy?

When we divide 50 by 6, we get 8 as the quotient and 2 as the remainder. As we cannot buy a notebook with 2 rupees, we can buy 6 notebooks.

Example 13-Suppose you have 9 metres of ribbon and you want to make 6 equal pieces. What will be the length of each ribbon?

When we divide 9 by 6, we get 1 as a quotient and 3 as a remainder. We know that 3 is half of 6, and a ribbon can be of any length, so we don't need to round up or down and can give the answer as one and a half metre.

Exercise 2.2

1. In the division example given below, give

$$
\begin{array}{r}
142 \\
6\overline{)853} \\
6 \\
\hline
25 \\
24 \\
\hline
13 \\
12 \\
\hline
1
\end{array}
$$

   (a) the dividend
   (b) the divisor
   (c) the remainder
   (d) verify the answer.
2. Fill in the blanks:
   (a) 23 ÷ ___ = 1
   (b) 0 ÷ 34 = ___
   (c) ___ ÷ 1 = 175
3. Observe the pattern in writing these numbers are and write the next two terms
   (a) 32, 16, 8, 4, ____, ____.
   (b) 1,00,000: 10,000; 1,000; 100; ____; ____.
4. Round the following to the nearest ten:
   (a)72
   (d)163
   (e)155
   (f) 45
5. Round the following to the nearest hundred:
   (a) 473
   (b) 380
   (c) 1479
   (d) 1821
   (e) 1450
6. Divide the following and verify your answer.

   (a) $7\overline{)452}$ (b) $8\overline{)823}$ (c). $9\overline{)909}$ (d) $3\overline{)4573}$

   (e) $5\overline{)6553}$ (f) $9\overline{)6752}$ (g) $8\overline{)8413}$ (h) $6\overline{)1821}$

7. Divide the following and verify your answer:

(a) $23\overline{)94}$	(b) $56\overline{)857}$	(c) $47\overline{)1325}$	(d) $35\overline{)714}$
(e) $71\overline{)3550}$	(f) $41\overline{)2480}$	(g) $86\overline{)6025}$	(h) $43\overline{)8795}$

8. Eight boys went for a picnic that cost them Rs.72. If they share the expenses equally, how much would each have to pay?
9. A school hall has 270 benches. If 5 students can sit on a bench, how many students can be seated in the hall?
10. Kamal had 70-rupees and he wanted to buy notebooks each costing 8 rupees.
    (a) How many notebooks can he buy?
    (b) How much should he pay the shopkeeper?
    (c) If he paid 70 rupees to the shopkeeper, how much money should the shopkeeper return to him?
11. Five persons can be seated in a taxi. If a family has 8 members, how many taxis would be needed to go to a movie?
12. Annu bought a bag of sweets to distribute to her classmates on her birthday. The bag contained 125 sweets, she gave 4 sweets to each and 5 sweets were left over. How many children were present that day?
13. A car uses 2 litres of petrol for travelling 30 kilometres. How much petrol would it need for travelling 75 kilometres?
14. In the questions given below, solve them if enough information is given. If enough information is not given, point out what information is needed to solve the problem.
    (a) Bill bought 4 bottles of Pepsi cola at Rs. 18 each. How much change will he get from the shopkeeper?
    (b) If an egg tray holds 12 eggs, how many egg trays should you buy to have 48 eggs?
    (c) How many minivans will be needed to transport 142 children?
    (d) A garland has 45 pearls. If you want to make 25 such garlands, how many pearls would you need?
15. Make up stories that require the following calculations:
    (a) 70 + 50
    (b) 30 ÷ 6
    (c) 20 - 7
    (d) 50 - (6 +8)
    (e) 100 × 8
16. If you find 40 times me, divide the product by 4 and you will get 700. What number am I?
17. The product of a number with me is zero. What number am I?

Take-Home

1. How do you use mathematics in daily life? Write a paragraph on it and present it in class.
2. **Example:** (a) Write 4 mathematical statements using combinations of operations of addition, subtraction, multiplication, and division or their combination For which the answer is 13.
   (b) Make stories for these.
   The answer to all these mathematical statements using different operations is 13:
   (a) 4 + 4+ 5 = 13.
   (b) 20 - 7 = 13.
   (c) 2 × 5 + 3 = 13.
   (d) (100 ÷ 5) - 7 = 13.
   We can make up the following stories for these statements.
   (a) Rani, Sudha, and Avani went for a walk on the beach. Rani found 5 shells, Sudha 4 and Avani 4. How many shells did the friends find?
   (b) Rajan had 20 rupees, he bought a bar of chocolate for Rs.7. How much money does Rajan have now?
   (c) Mukesh walked 2 km for 5 days and 3 km on the sixth day. How many km did he walk in all?
   (d) A flower girl had 100 roses. She tied these into bunches of 5 flowers and sold 7 of them. How many bunches of flowers does she have now?
3. (a) Write 4 mathematical statements using combinations of operations of addition, subtraction, multiplication, and division or their combination for which the answer is 18.
   (b) Make stories for these mathematical statements.

UNIT 3

Multiples and Factors

Watch the video: https://youtu.be/mkEWqspRVKk

Multiples

The product of a number by any number is called a multiple of the number. For example, if we multiply 1, 2, 3, 4, 5… by 5, we get. 5, 10, 15, 20, 25… All of them are multiples of 5.

A number can have any number of multiples.

Example 1: Find first 5 factors of 7.

$1 \times 7 = 7$

$2 \times 7 = 14$

$3 \times 7 = 21$

$4 \times 7 = 28$

$5 \times 7 = 35$

First five multiples of 7 are 7, 14, 21, 28, and 35.

Factors

Watch the video: https://youtu.be/0NvLtTwnUHs

If a number divides another number without a remainder, the number is said to be a factor of the other number. We will restrict to two-digit numbers only.

$42 \div 7 = 6$, therefore 7 is a factor of 42.

We know that if $42 \div 7 = 6$, $42 \div 6 = 7$.

When a number divides another number exactly, the quotient is also a factor of the number(dividend).

Any number except 1 has 2 or more factors.

When we multiply two or more than two numbers, each number is a factor of the product.

For example, $6 \times 7 = 42$; 6 and 7 are both factors of 42.

Similarly $2 \times 3 \times 4 = 24$; 2, 3, and 4 are factors of 24.

Finding all factors of a number

A number has only a limited number of factors

While we can find all factors of a number by dividing the number by 1, 2, 3, 4, and so on and checking whether it is divisible or not. We can use some generalizations to shorten our work. These are

- As any number divided by 1 is equal to the number, One is a factor of any number and is the smallest factor.
- As any number divided by the number itself is equal to 1, the number itself is a factor of any number and is the greatest factor.
- As the digit in one's place in all multiples of 10 is 0, 10 is a factor of only numbers that end in 0.
- As the digit in one's place in all multiples of 5 is 5 or 0, 5 is a factor of only numbers that end in 0 or 5.
- As all multiples of 2 are even, 2 is a factor of only even numbers.

- As all multiples of even numbers are even, any even number is not a factor of any odd number.
- If any divisor is a factor of the number, then the quotient is also the factor. That is if 7 is a factor of 63, the quotient 9 obtained by dividing 63 by 7 is also a factor.
- We stop checking higher numbers when the quotient and divisor are interchanged.

Example 2-Find all factors of 30

As 30 ÷ 1 =30, 1 and 30 are factors of 30.

As 30 ÷ 2 =15, 2 and 15 are factors of 30.

As 30 ÷ 3 = 10, 3 and 10 are factors of 30.

As 30 ÷ 4 = 7R2, 4 is not a factor of 30.

As 30 ÷ 5 = 6, 5 and 6 are factors of 30.

As 30 ÷ 6 = 5 and 30 ÷ 5 = 6, we stop here as the divisor and quotient are interchanged.

All factors of 30 are 1, 2, 3, 5, 6, 10, 15, and 30.

Example 3-Find all factors of 25

As 25 ÷ 25 = 1, 1 and 25 are factors of 25.

As 25 is odd, 2, 4, and 6 are not factors of 25.

As 25 ÷ 3 = 8R1, 3 is not a factor of 25.

As 25 ÷ 5 = 5, 5 is a factor of 25.

We stop here as 5 the quotient of 25 ÷ 5 is the divisor here as the divisor and quotient are interchanged

All factors of 25 are 1, 5, and 25.

If a number is a factor of a number, all its factors are also factors of the number.

That is if 6 is a factor of 60, all its factors 1, 2, 3, and 6 are also its factors. (Verify it)

Exercise 3

1. Write the first 10 multiples of 2. Are all these numbers even?
2. Write the first 10 multiples of 5, what you notice about the digit in one's place.
3. Write the first ten multiples of 10, what you notice about the digit in one's place.
4. Write the first 5 multiples of 100.
5. Write the first 5 multiples of 1000.
6. Which of the following numbers are multiples of 10?
   1, 40, 45, 63, 700.
7. Fill in blanks:
   (a)_____and _____ are factors of any number.
   (b)_____is a multiple of any number.
   (c) All multiples of even numbers are _____.
   (d) _____is a factor of all even numbers.
8. Name the digits in one's place of
   (a) even numbers
   (b) odd numbers
   (c) multiples of 5
   (d) multiples of 10.
9. Which of the following numbers are even?
   3, 6, 17, 20, 45, 64, 69
10. Which of the following numbers are odd?
    1, 63, 58, 57, 34, 91, 40
11. (a) Is 3 a factor of 11?
    (b) Is 7 a factor of 63?
    (c) Is 8 a factor of 56?
12. Name the numbers for which you can rule it out 2 as a factor. Explain why.
    21, 30, 45, 53.
13. Name the numbers for which you can rule it out 5 as a factor. Explain why.
    43, 50, 67, 50.
14. Name the numbers for which you can rule it out 6 as a factor. Explain why.
    51, 67, 30, 45.
15. Encircle every 5^{th} number and every 6^{th} number in the hundred table in Appendix 1. Were any of the numbers encircled twice? What does it mean?
16. If a number is a factor of a number, would all its factors be factors of that number? If not, give a counterexample.
17. If a number is a factor of a number, would all its multiples be factors of that number? If not, give a counterexample.
18. Find all factors of
    (a) 16 (b) 30 (c) 24 (d) 40

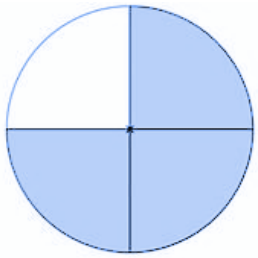
UNIT 4

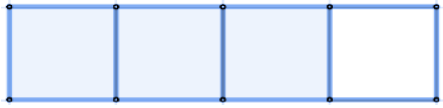
Fractions

Watch the video: https://youtu.be/CA9XLJpQp3c

Regional model

If a region can be divided into a number of equal parts, say 4 then each part is one-fourth of the original figure.





Three equal parts that are coloured represent three-fourths of the original figure. We write it as $\frac{3}{4}$.

In a fraction, the number below the line(-) is called the **denominator** and tells in how many parts a whole is divided and the number above the line is called the **numerator** and tells how many of the parts are being talked about. For example, in $\frac{3}{5}$, 3 is the numerator and 5 is the denominator.

Set Model

Find fraction of a set of objects

Example 1-Find $\frac{1}{5}$of 20.

Take 20 counters and arrange them in an array, by keeping 5(the number in the denominator) counters in a row, and then go on keeping 5 in the next row until all the counters are used. It will require 4 rows. Now the number of counters in each column is 4.

(If you don't have counters you can draw similar figures for each counter)

Thus one-fifth of a collection of 20 objects is 4.

Similarly we can find other fractions whose denominator is 5 by counting counters in as many columns as the numerator.

For example to find

$\frac{2}{5}$of 20, count the counters in 2 columns.

As that is 8, $\frac{2}{5}$of 20 = 8.

$\frac{3}{5}$ of 20, count the counters in 3 columns.

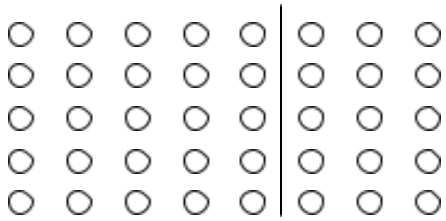
As that is 12, $\frac{3}{5}$of 20 = 12.

$\frac{4}{5}$ of 20, count the counters in 4 columns.

As that is 16, $\frac{4}{5}$of 20 = 16.

Example 2- Find $\frac{5}{8}$ of 40.

Take 40 counters and arrange them in a grid as follows:
Put 8 counters(the number in the denominator) in each row until we have used all the counters. You will notice that it will take 5 rows and 8 columns to arrange all the counters.
Then count the number of counters in 5 columns.



As the number of objects in 5 columns is 25, therefore five-eighth of 40 is 25.

Like and unlike fractions

The fractions with the same denominator are called like fractions e.g.
$\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{8}{8}$

The fractions with different denominators are called unlike fractions e.g.
$\frac{2}{3}$, $\frac{4}{7}$, $\frac{1}{8}$.

Unit fractions

The fractions that have 1 as a numerator such as $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{8}$, are called unit fractions. These represent one part out of a number of parts into which a whole is divided.

Proper fractions

A fraction in which the denominator is greater than the numerator is called a proper fraction e.g. $\frac{4}{6}$, $\frac{7}{8}$, $\frac{2}{9}$.

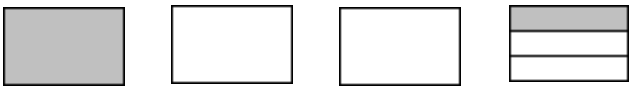
Improper fractions

A fraction in which the denominator is less than the numerator is called improper fraction e.g. $\frac{3}{2}$, $\frac{7}{4}$, $\frac{8}{3}$.

Improper fractions can be represented by a whole figure and a fractional part of a figure that has the same size and shape.

Example 3- $\frac{4}{3}$represents $\frac{1}{3}$ of 4 wholes.

Let a rectangle represent one whole, then 4 rectangles of same shape and size would represent 4 wholes.
To shade one-third of these, we shade 1 whole rectangle from 3 and then divide the remaining rectangle into 3 equal parts and shade one of those.



The shaded part is $1 + \frac{1}{3}$.

Mixed numbers

We can also express $1+\frac{1}{3}$ as $1\frac{1}{3}$.

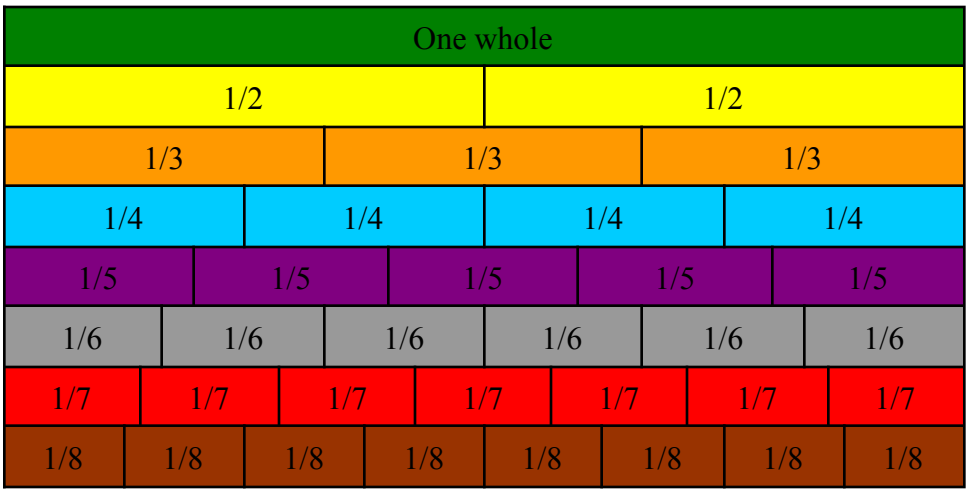
The numbers that are a combination of a whole number and a fraction are called mixed numbers.

Comparison of fractions

Watch the video: https://youtu.be/0H119MJdnPI

Use of a fraction chart

We can use a fraction chart like the one given below in which the same size strips are divided into a number of equal parts to compare the fractions.



If we take the green strip as one whole, then each yellow strip is $\frac{1}{2}$, two yellow strips are $\frac{2}{2}$ or 1. Similarly, each orange strip is $\frac{1}{3}$, two orange strips are $\frac{2}{3}$, 3 orange strips are $\frac{3}{3}$ or 1 and so on.

Comparison of like fractions

Like fractions refer to a different number of parts of the same strip. The fraction chart shows that for any strip say red,

$\frac{1}{7} < \frac{2}{7} < \frac{3}{7} < \frac{4}{7} < \frac{5}{7} < \frac{6}{7} < \frac{7}{7}$ *or* 1.

That is among fractions with the same denominator a fraction with a larger numerator is larger.

Comparison of fractions with the same numerator

The fractions with the same numerator refer to the same number of parts of different strips e.g. $\frac{2}{3}, \frac{2}{5}, \frac{2}{7}$.

The fraction chart shows that 1 or $\frac{2}{2} > \frac{2}{3} > \frac{2}{4} > \frac{2}{5} > \frac{2}{6} > \frac{2}{7} > \frac{2}{8}$.

That is among fractions with the same numerator as the denominator of a fraction increases it becomes smaller.

Comparison of unit fractions

Unit fractions refer to one part of a strip divided into a different number of parts. The fraction chart shows that $\frac{1}{2} > \frac{1}{3} > \frac{1}{4} > \frac{1}{5} > \frac{1}{6} > \frac{1}{7} > \frac{1}{8}$.

That is, unit fractions with larger denominators are smaller.

Comparison of unlike fractions

We can compare fractions with denominators up to 8 by the fraction chart given above by finding the strips that represent two fractions and then comparing their length. For example, $\frac{1}{3} < \frac{1}{2}$ as the orange strip is smaller than the yellow strip; $\frac{2}{3} > \frac{1}{2}$ as the length of two orange strips is greater than the length of one yellow strip.

If the length of strips represented by two fractions is the same, they are called **equivalent fractions**. For example, strips that show $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, and \frac{4}{8}$ have the same length and hence are equivalent. (You can keep a scale vertically on the fraction chart at the fraction to find some fractions equivalent to it.)

What do you notice about the relation between numerator and denominator of these fractions? (The denominator is twice the numerator.)

Can you identify some other fractions for which the fraction strips are not shown in the chart that are the same as $\frac{1}{2}$ based on this pattern?

Use of rules

We know from the fraction chart that

$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$.

As we can write

$\frac{1}{2} = \frac{1\times2}{2\times2} = \frac{1\times3}{2\times3} = \frac{1\times4}{2\times4}$

This shows that we can find equivalent fractions by multiplying the numerator and denominator of a fraction by the same number. This holds for any fraction.

We can also write

$\frac{2}{4} = \frac{2\div2}{4\div2} = \frac{1}{2}$

$\frac{3}{6} = \frac{3\div3}{6\div3} = \frac{1}{2}$

$\frac{4}{8} = \frac{4\div4}{8\div4} = \frac{1}{2}$

Thus we can also find equivalent fractions by dividing the numerator and denominator of a fraction by their common factor.

We can check if fractions are equivalent or not by finding cross products of the numerator of one fraction with denominators of the other fraction. Fractions are equivalent only if the two cross products are equal. For example,

$\frac{5}{8}$ and $\frac{15}{24}$ are equivalent as $24\times5 = 15\times8 = 120$.

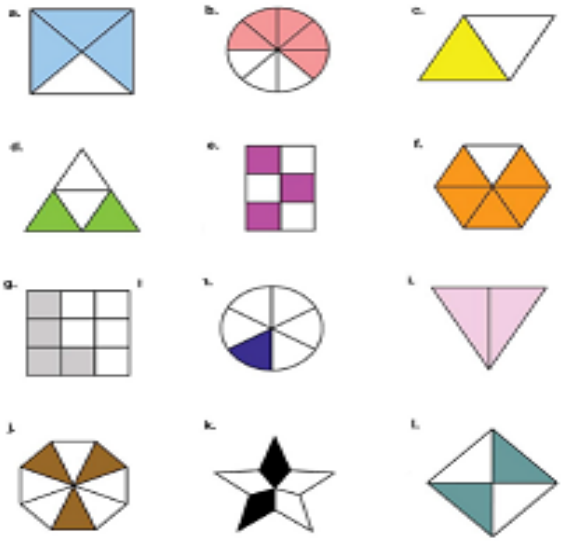
$\frac{4}{5}$ and $\frac{15}{24}$ are not equivalent as $24\times4 \neq 15\times5$.

Exercise 4

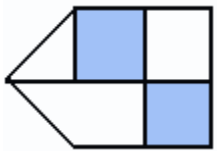
1. In the fraction chart given below what fraction is represented by the following:
   (a) 2 orange strips (b) 3 red strips (c) 5 red strips
   (d) 1 orange strip (e) 1 yellow strip (f) 2 blue strips

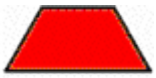
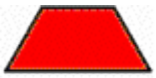
One whole							
1/2							
1/3							
1/4							
1/5							
1/6							
1/7							
1/8							

2. (a) Which of the fractions are unit fractions in Question 1?
   (b) Which of the fractions are like fractions in Question 1?
   (c) Which of the fractions are equivalent fractions in Question 1?
3. What fraction of the following shapes are shaded?

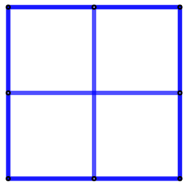


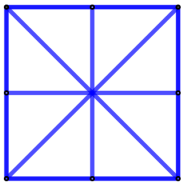
4. What fraction of the shape given below is shaded? (Hint: break it into smaller pieces)



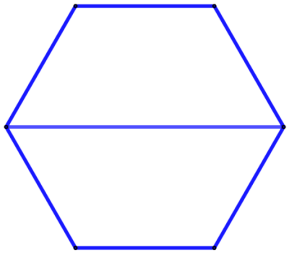
5. Use counters or drawings to find
   (a) $\frac{3}{4}$ *of* 16 (b) $\frac{1}{4}$ *of* 12 (c) $\frac{2}{3}$ *of* 9 (d) $\frac{1}{5}$ *of* 10
   (e) $\frac{3}{8}$ *of* 16 (f) $\frac{3}{7}$ *of* 35 (g) $\frac{2}{9}$ *of* 27 (h) $\frac{7}{10}$ *of* 40
6. Use the fraction chart to find fractions that are equivalent to the following fractions:
   (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{8}$ (d) $\frac{4}{6}$
7. Use a fraction chart to compare the following fractions and write >, <, or = in the box between fractions.
   (a) $\frac{2}{6} \square \frac{5}{6}$ (b) $\frac{1}{6} \square \frac{1}{8}$ (c) $\frac{1}{2} \square \frac{1}{3}$ (d) $\frac{2}{6} \square \frac{2}{8}$
   (e) $\frac{2}{3} \square \frac{1}{2}$ (f) $\frac{3}{6} \square \frac{1}{2}$ (g) $\frac{6}{7} \square \frac{5}{6}$ (h) $\frac{2}{6} \square \frac{5}{6}$
8. You may trace and cut these figures to answer these questions.
   (a) How many triangles would cover the rhombus completely?
   (b) The triangle is what fraction of the rhombus ?
   (c) How many triangles would cover the trapezium  completely?
   (d) This triangle is what fraction of the trapezium  ?
   (e) How many triangles would cover the hexagon completely?
   (f) This triangle is what fraction of the hexagon ?
   (g) How many trapeziums would cover the hexagon completely?
   (h) This trapezium is what fraction of the hexagon ?

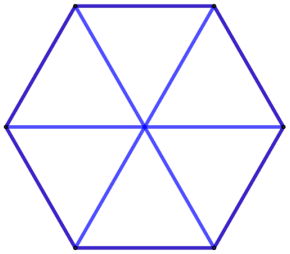
9. Use fraction chart to find
   (a) Which fraction is closest to 1- 2/3, 4/5, 6/7, 7/8
   (b) Which fraction is closest to 1/2-2/3, 3/5, 4/7, 5/8
   (c) Which fraction is closest to 3/4-1/2, 2/3, 7/8
   (d) Which fraction is closest to 1/4- 1/3, 1/5, 2/7
10. Shade the part given below in the first figure, then shade an equivalent part of the second figure.
   (a) $\frac{3}{4}$



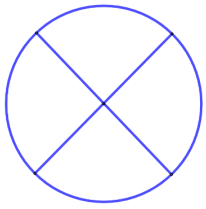


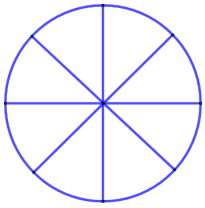
   (b) $\frac{1}{2}$





   (c) $\frac{1}{4}$



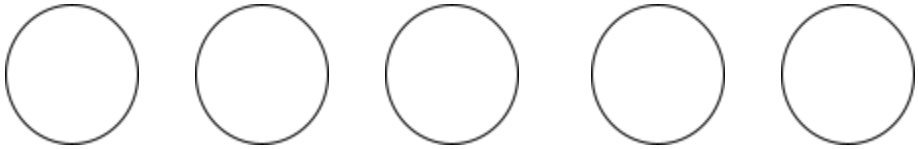


11. Arrange the following fractions in ascending order(from smallest to largest):
   (a) $\frac{2}{8}, \frac{4}{8}, \frac{7}{8}$ (b) $\frac{1}{4}, \frac{1}{8}, \frac{1}{7}$ (c) $\frac{1}{5}, \frac{1}{6}, \frac{1}{2}$
12. Arrange the following fractions in descending order(from largest to smallest):
   (a) $\frac{3}{6}, \frac{3}{7}, \frac{3}{4}$ (b) $\frac{2}{3}, \frac{2}{8}, \frac{2}{5}$ (c) $\frac{5}{8}, \frac{5}{4}, \frac{5}{3}$
13. Write 3 fractions equivalent to fractions given below:
   (a) $\frac{1}{2}$ (b) $\frac{2}{5}$ (c) $\frac{2}{3}$
14. Arrange the following fractions in descending order: (Hint: First change the fractions to equivalent fractions with the same denominator.)

(a) $\frac{4}{15}, \frac{3}{5}, \frac{2}{3}$ (b) $\frac{1}{2}, \frac{7}{8}, \frac{3}{4}$ (c) $\frac{3}{4}, \frac{5}{6}, \frac{7}{12}$

15. Write 3 proper fractions.
16. Write 3 improper fractions.
17. Write 3 mixed numbers.
18. Convert the following improper fractions into mixed numbers
    (a) $\frac{10}{8}$ (b) $\frac{5}{3}$
19. Convert the following mixed numbers into improper fractions.
    (a) $1\frac{6}{7}$ (b) $3\frac{3}{4}$
20. Divide the following into 3 equal parts, shade one part and write it as an improper fraction as well as a mixed number

21. Divide the following into 2 equal parts, shade one part and write it as an improper fraction as well as a mixed number.

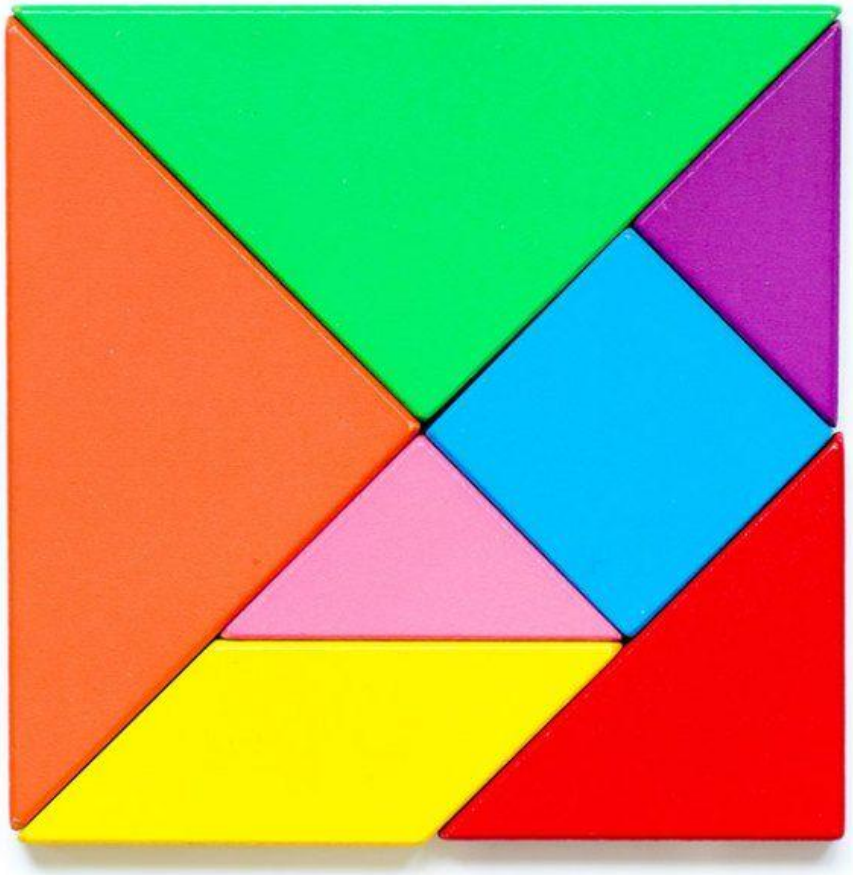


22. Anil spends one-tenth of his pocket money on chocolates. How much does he spend on chocolates if his pocket money is 100 rupees?
23. A shopkeeper had 20 metres of cloth of a particular design. He sold one-fourth of it. How many metres of cloth did he sell? How much cloth is left over?
24. A family spends one-third of its income on food and one fourth of its income on rent. Does it spend more money on food or rent?
25. Ranjana cut a watermelon into 8 equal pieces. She gave 3 pieces to Anil. What part of the melon did Anil get?
26. A chocolate bar had 12 equal pieces. It was divided equally among 8 children. What part of the chocolate did each child get?
27. A bag of cherries had 48 cherries. It was divided among 4 members of a family. How many cherries did each member get?

Activities with Tangrams

A **tangram** is an old Chinese puzzle and consists of seven tangram pieces that form a square..

A tangram is given below:



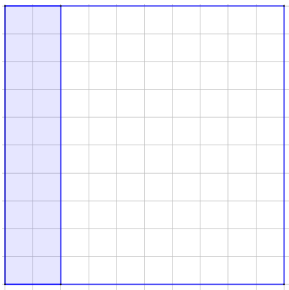
This tangram is also given in Activity sheet 4.2. You can remove it and cut it into 7 pieces.
In all the questions given below take the region covered by the square as one unit.

1. (a) How many pink triangles would cover the square fully?
   (b) Pink triangle represents what fraction of the region covered by the square?
2. (a) How many pink triangles would cover the parallelogram?
   (b) Pink triangle represents what fraction parallelogram?
3. (a) How many pink triangles would cover the red triangle?
   (b) Pink triangle represents what fraction of the region covered by the red triangle.
4. (a) How many pink triangles would cover the orange triangle?
   (b) Pink triangle represents what fraction of the region covered by orange triangle?
5. (a) How many pink triangles would cover the big square made up of all tangrams (the above figure of tangram)?
   (b) Pink triangle represents what fraction of the region covered by the big square?

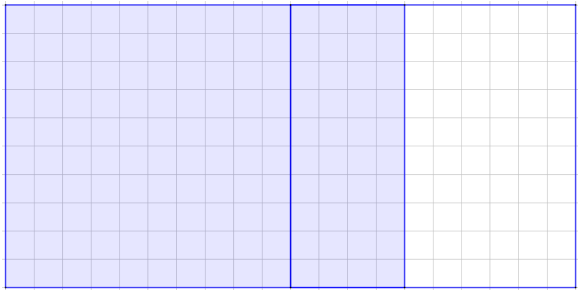
UNIT 5

Decimals

Watch the video: https://youtu.be/Mst8iZjIpFE
Decimals are special fractions that have 10, 100, 1000 and so on as a denominator
Concept of tenths
Mark a 10 × 10 grid on graph paper and take this square as one **unit**.



A column made up of 10 small squares divides the square into 10 equal parts or is 1/10 of the whole. We will call it a **long**.
We denote it by 0.1 in decimal notation.
We read it as zero point one.
In the above grid, 2 longs or 2/10 of the grid is shaded.
We write it as 0.2 in decimal notation.
Decimals larger than 1



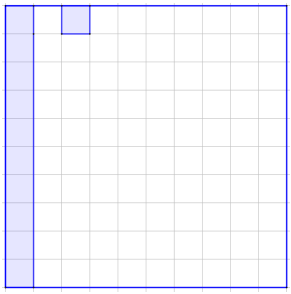
In the above graph, one unit and four-tenths shaded. We write it as $1\frac{4}{10}$ or 1.4 in decimal notation and read it as one point four.

Exercise 5.1

1. Write the following fractions as decimals:
   (a) 1 unit and 2 tenths (b) 2 units
   (c) 0 units and 6 tenths (d) 5 tenths
2. Write the following decimals in words:
   (a) 0.4 (b) 1.8 (c) 2.0 (d) 3.9 (e) 24.9
3. Shade the following portion on a graph paper or in Activity Sheet 4.1 using a 10 × 10 square as a unit.
   (a) 0.6 (b) 1.5 (c) 2.7 (d) 2.0
4. Write the following in decimals:
   (a) zero point five (b) one point six (c) ten point four
5. Write the following decimals as fractions:
   (a) 0.7 (b) 1.4 (c) 2.3 (d) 5.0 (e) 10.3
6. Write the following fractions as decimals:
   (a) $\frac{3}{10}$ (b) $2\frac{6}{10}$ (c) $3\frac{9}{10}$ (d) $\frac{2}{5}$

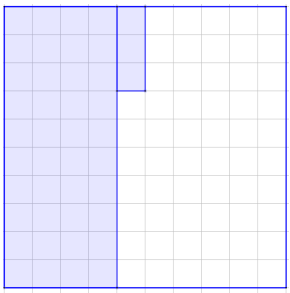
Concept of hundredths

Mark a 10 × 10 square on a graph paper and take it as a unit.



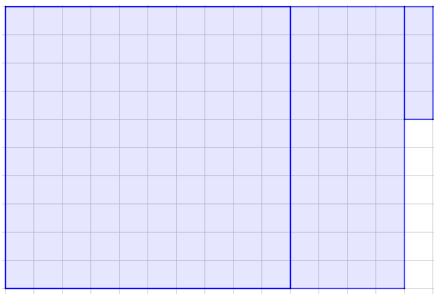
1. Each small square represents one-hundredth of the unit. We will call it a **short**
2. We write a short or $\frac{1}{100}$ in decimals as 0.01
3. Hundredths are written to the right of the tenths column when writing numbers in figures. That is, we write units, decimal point, tenths and hundredths from left to right.

Example 1



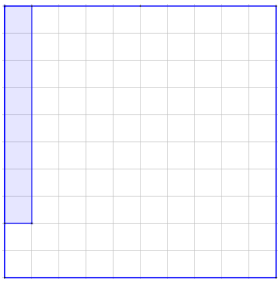
In the above graph 0 units, 4 tenths and 3 hundredths or 43 hundredths are shaded.
We write it as 0.43.
We read it as zero point four three(not zero point forty-three).

Example 2



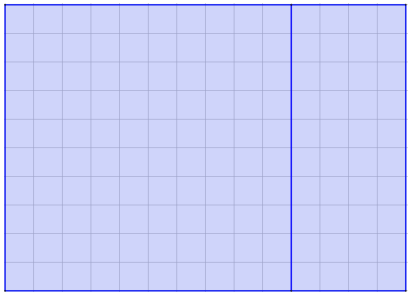
In the above graph in 1 unit, 4 tenths and 4 hundredths or 1 unit and $\frac{44}{100}$ hundredths are shaded.
We write it in decimals as 1.44
We read it as one point four four.

Example 3



In the above graph 0 units, 0 tenths and 8 hundredths are shaded..
We write it in decimals as 0.08.
We read it as zero point zero eight.

Example 4



In the above graph 1 unit, 4 tenths and 0 hundredths or 1 unit and 40 hundredths or $1\frac{4}{10}$ *or* $1\frac{40}{100}$ are shaded.
We read it as one point four zero.
We write it as 1.40.

1.40 is the same as 1.4.

Place value of decimals and writing decimal numbers in expanded form

Watch the video: https://youtu.be/KG6ILNOiMgM

We have learnt that the place value of a digit in a whole number depends on its position. As we move towards the left the place value of a digit is ten times the place value of the digit before it. Or the place value of the digit is one-tenth of the digit before it as we move toward the right. This continues after the decimal point also. The point acts as a separator between the whole numbers and fractional parts. The first place after the decimal point is called the **tenths place** and has a value $\frac{1}{10}$, the second place after the decimal point is called the **hundredths place** and has a value $\frac{1}{100}$,the third place after the decimal point is the thousandths place and has a value $\frac{1}{1000}$, and is called the **thousandths place** and so on.

We can write the decimal number in expanded form in the same manner as in whole numbers adding tenths and hundredths, ... for digits after the decimals e.g.
25.4 = 2 tens + 5 ones + 4 tenths.

2.75 = 2 ones + 7 tenths + 5 hundredths.

3.08 = 3 Ones + 0 Tenths + 8 hundredths

7.80 = 7 ones + 8 tenths + 0 hundredths or 7 ones + 8 tenths

Comparison of decimal numbers

We can compare decimal number in the same manner as in whole numbers and continuing till the digits after the decimal place if the numbers after the decimal points are the same e.g.
7.6 > 5.9, 6.8 > 6.5, 3.94 > 3.87, 0.76 > 0.72
If the number of digits after the decimal point are different in the numbers being compared, it is a good strategy to first make the number of digits the same in both numbers by adding zeros.
3.7 > 3.0, 4.50 > 4.37, 18.65 > 18.60, 5.00 > 4.86

Rounding of decimal numbers

We can round decimal number in the same manner as in whole numbers e.g.
To round a decimal number to the nearest whole number/nearest tenth.
1. Underline the digit in ones or tenths place.
2. Look at the digit next to it that is in tenths/hundredths place.
3. If this digit is greater than or equal to 5, round it to the number that comes just after the whole number/tenths otherwise ignore it.

Example 5

Round 8.8 to the nearest whole number.1. We first underline 8, the digit in ones place in the whole number 8.7.

2. The digit in tenths place is 7 which is greater than 5, therefore we round 8.7 to 9.

Example 6

Round 125.3 to the nearest whole number.
1. We first underline the digit in ones place- 5125.2

2. The digit in tenths place is 2 which is less than 5, therefore we ignore 2 and round 125.2 to 125.

Example 7

Round 8.8 to the nearest whole number.
1. We first underline 8, the digit in ones place 8.7.

2. The digit in tenths place is 7 which is greater than 5, therefore we round 8.7 to 9.

Example 8

Round 8.77 to the nearest tenth.
1. We first underline 7, the digit in tenths place 8.76.

2. We look at the digit in the hundredth place which is 6. As 6 is greater than 5, therefore we round 8.76 to 8.8.

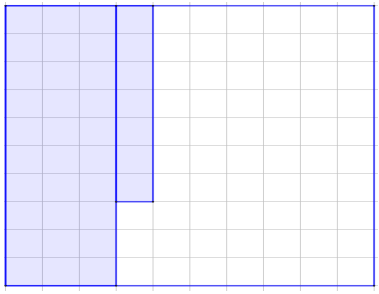
Example 9

Round 3.98 to the nearest tenth.
1. We first underline 9, the digit in tenths place 3.98.

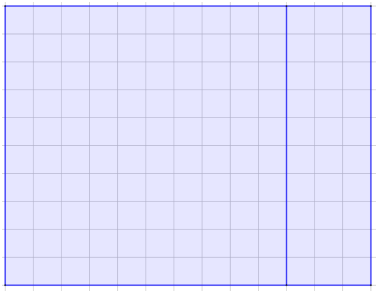
2. We look at the digit in the hundredth place which is 8. As 8 is greater than 5, therefore we round up to the next tenth, which is 10 in this case. Recall that 10 tenths are the same as 1. Therefore we have to round the digit in ones place, to the next whole number which is 4. Therefore we round 3.98 to 4.

Exercise 5.2

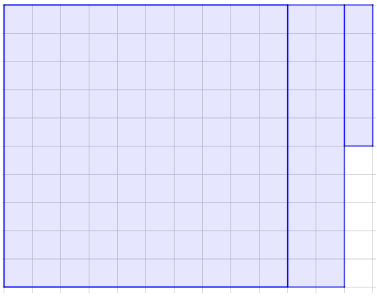
1. Mark a 10 × 10 square on graph paper and show by shading
   (a) one tenth (b) one hundredth
2. Write the following decimal numbers in figures:
   (a) Zero point five (b) Two point seven (c) Thirteen point six
   (d) Zero point six two (e) Ten point four five (f) Sixty four hundredths
   (g) Forty hundredths (h) Three hundredths (i) Seven hundredths
3. Write the following decimal numbers in words:
   (a) 0.8 (b) 7.6 (c) 8.0 (d) 15.9 (e) 76.8
   (f) 0.78 (g) 8.45 (h) 9.50 (i) 45.07 (j) 0.04
4. Write the following fractions as decimals:
   (a) $\frac{7}{10}$ (b) $5\frac{6}{10}$ (c) $10\frac{9}{10}$ (d) $4\frac{3}{5}$ (e) $2\frac{1}{2}$
   (f) $\frac{73}{100}$ (g) $4\frac{56}{100}$ (h) $\frac{50}{100}$ (i) $74\frac{67}{100}$ (j) $\frac{8}{100}$
5. Write the following decimals as fractions:
   (a) 0.4 (b) 2.7 (c) 3.5 (d) 6.2
   (e) 0.49 (f) 6.78(g) 7.50 (h) 23.03
6. In the graph given below, taking the 10 × 10 square as a unit, write in decimal notation the parts which are shaded:



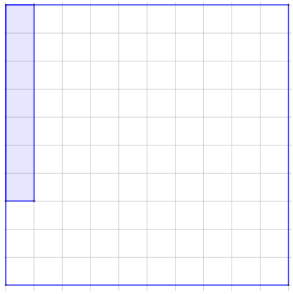
(a)



(b)



(c)



(d)

7. Write the number of hundredths following decimals
   (a) 0.7 (b) 0.46 (c) 0.3
8. In the pair of numbers given below, which number is larger?
   (a) 0.5 or 0.47 (b) 0.45 or 0.7 (c) 1.78 or 2

9. In the pair of numbers given below, which number is smaller?
   (a) 0.65 or 0.42 (b) 0.67 or 0.8 (c) 0.3 or 1.59
10. Compare the decimals given below by writing > or < or = between them:
   (a) 9 ___8.59 (b) 0.63___0.7 (c) 0.6___0.60
   (d) 0.892___0.85 (e) 0.78___0.8 (f) 0.67___0.6
11. Write the following numbers in ascending order (from smallest to largest):
   (a) 0.34, 0.6, 0.65
   (b) 0.5, 0.78, 0.46
   (c) 1.5, 0.28, 0.7
12. Write the following numbers in descending order (from largest to smallest):
   (a) 0.54, 0.6, 0.47
   (b) 0.3, 0.03, 0.07
   (c) 2.7, 1.78, 0.96, 0.5
13. Write the numbers given below in expanded form:
   (a) 1.42 (b) 0.57 (c) 2.70
   (d) 2.05 (e) 0.60 (f) 0.05
14. Write the numbers given below in standard form:
   (a) 4 ones + 3 tenths + 2 hundredths
   (b) 5 tenths + 7 hundredths
   (c) 2 ones + 7 tenths
   (d) 6 tenths
   (e) 8 hundredths
15. Write the place value of the specified digit in the numbers given below:
   (a) 4 in 324 (b) 5 in 27.5 (c) 8 in 5.68 (d) 2 in 456.2 (e) 6 in 70.06
16. Name the place of the digit coloured red in the numbers given below:
   (a) 763 (b) 23.6 (c) 8.59 (d) 5,678 (e) 0.50
17. Round the numbers given below to the nearest whole number:
   (a) 3.42 (b) 37.57 (c) 2.70
   (d) 2.05 (e) 0.60 (f) 0.05
18. Round the numbers given below to the nearest tenth:
   (a) 7.43 (b) 37.57 (c) 6.50
   (d) 12.05 (e) 235.68 (f) 0.05

Application of decimals to measurement

Length

1 metre(m) = 100 centimetres(cm) or 1 cm = $\frac{1}{100}$m or hundredth of a metre or 0.01cm

We can write 25 cm as as 0.25 m
1 m and 45 cm as 1.45 m

Also 1 cm = 10 mm or 1mm = $\frac{1}{10}$cm = 0.1 cm

We can write 5 mm as 0.5 cm and 3 cm and 7 mm as 3.7 cm
In the US other measures of length called yards, feet and inches are also used.

1 yard = 3 feet
1 feet = 12 inches

We will only use the metric units in this book.

Money

Different countries have different currencies e.g. dollar ($) in the US, £ in England.
In India the currency is rupee(Rs.). We will use Indian Currency rupees now called INR in this book.
We will continue to use rupees in this book as that is generally used in daily life.

1 rupee = 100 paise

We used to have paise coins, but they are not minted now. But the cost of many things still involves both rupees and paise. For example, the price of gas is 631 rupees and 65 paise.
Since a rupee has 100 paise, 65 hundredths of a rupee is 0.65. Thus we can write 631 rupees and 65 paise as Rs. 631.65.

Exercise 5.3

1. Write the following measures in centimetres:
   (a) 3 cm and 5 millimetres (b) 6 millimetres
2. Write the following measures in metres
   (a) 2 metres and 34 centimetres (b) 54 centimetres
   (c) 3 metres and 55 centimetres (d) 7 metres and 20 centimetres
3. Write the following measures without decimals e.g. 4.5 cm = 4 centimetres and 5 millimetres:
   (a) 3.4 cm (b) 5.84 m (c) 4.5 m (d) 7.2 cm
4. How many paise coins does a rupee have?
5. Convert the following paise to rupees:
   (a) 400 paise = _____ rupees
   (b) 600 paise = _____ rupees
   (c) 125 paise = _____ rupees and _____paise
   (d) 470 paise = _____ rupees and _____paise
6. Convert the following rupees to paise:
   (a) 5 rupees = _____ paise
   (b) 1 rupee and 40 paise = _____ paise
   (c) 6 rupees and 60 paise = _____ paise
7. Write the following amounts of money in decimal form:
   (a) 3 rupees and 35 paise
   (b) 7 rupees and 50 paise
   (c) 4 rupees and 5 paise

UNIT 6

Money Transactions

There are many transactions involving money. We pay money for buying things, travel, school fees etc., and earn money for providing services, conducting business where the shopkeeper buys things at cheaper rates and then sells to others at a higher price to make a profit.

Money is available in denominations of one, two, five, ten, twenty, fifty, hundred, five hundred, and two thousand rupees. Rupees 1, 2, and 5 are available in coins also. We used to have coins of smaller denominations 1, 2, 5, 10, 25, and 50 paise. But we do not have them any more. However, the cost of many things involves both rupees and paise. For example, the price of gas is 631 rupees and 65 paise. Recall we had learnt to write it as 631.65 in short form. Since a rupee has 100 paise, now you can see that the dot stands for the decimal point. We can convert rupees and paise to rupees by writing paise after the decimal. We can then add and subtract money and multiply or divide by a number as in whole numbers ignoring the decimal point and then putting it at the end(always write paise in two digits, e.g. 50 paise as Rs.0.50, 43 rupees and 50 paise as Rs.43.50, 8 paise as Rs. 0.08, and 30 rupees and 8 paise as Rs. 30.08).

Ask the students to give situations of transactions that would require addition and subtraction of money and multiplication and division of money by a number.

In this unit, we will discuss some more transactions that require the addition and subtraction of money and division and multiplication of rupees by a number.

Rounding off to nearest rupee

As some prices involve paise, but as no paise coins are minted anymore, we need to round off the money to the nearest rupee. If the paise are less than 50 paise, we pay only the rupees part, if paise are equal to or more than 50 paise, we pay one rupee more for the paise.

For example, if the prices of different things are as follows, we pay the amount shown against them:

Rs 16.80 → Rs 17

Rs 27.25 → Rs 27

Rs 312.75 → Rs 313

Rs 240.50 → Rs 241

Unitary Method

If we are given the cost of one object, we can find the cost of a number of many such objects, say 5 by multiplying the cost of 1 object by 5.

Alternatively, if we are given the cost of a number of objects, say 12 we can find the cost of one object by dividing that cost by 12.

In the unitary method, we are given the cost of a number of objects and we want to find the cost of a different number of objects.

In such situations, we first find the cost of one object by dividing the cost of a number of objects by the number and then find the cost of a different number of objects by multiplying by that number.

Example 1

The cost of eggs is Rs. 24 a dozen (1 dozen = 12), how much would a person have to pay if he buys 6 eggs.

Cost of 12 eggs = Rs. 24.

Cost of 1 egg = Rs. $\frac{24}{12}$= Rs. 2

Cost of 6 eggs = Rs.$2 \times 6 = Rs. 12.$

Example 2

The cost of a roll of 25 metres of the water pipe is Rs.200. If Sunil bought 8 metres of water pipe, how much money would he have to pay?

The cost of 25 metres of pipe is Rs. 200.

Cost of 1 metre of pipe = $Rs. \frac{200}{25}$= Rs. 8

Cost of 8 metres of pipe = $Rs. 8 \times 8 = Rs. 64.$

Exercise 6.1

1. Write the following amounts of money in decimal form:
   (a) 3 rupees and 35 paise
   (b) 7 rupees and 50 paise
   (c) 4 rupees and 5 paise
2. Round the following to the nearest rupee:
   (a) 46 rupees and 25 paise
   (b) 18 rupees and 72 paise
   (c) 104 rupees and 50 paise
3. If oranges are Rs 36 a dozen (1 dozen = 12), what will be the cost of
   (a) 1 orange
   (b) 8 oranges
4. The price of tomatoes is Rs 48 per kg, what would be the cost of
   (a) 5 kg of tomatoes?
   (b) $\frac{1}{2}$ kg of tomatoes?
   (c) $\frac{1}{4}$kg of tomatoes?
5. A bottle of 100 ml of a tonic costs Rs 40.
   (a) What would be the cost of 200 ml of the same tonic?
   (b) If a bottle of 200 ml of tonic costs Rs 75, how much do you save by buying the 200 ml bottle of tonic?
6. The cost of potatoes is Rs 16 per kg, what would be the cost of
   (a) 2 kg of tomatoes?
   (b) $\frac{1}{2}$ kg of tomatoes?
   (c) $\frac{1}{4}$kg of tomatoes?

Profit and Loss

We buy things daily from the market. The shopkeeper buys those from the wholesale market at a cheaper price. He sells those at a higher price to earn some money. For example, if he buys apples at Rs. 20 per kg and sells those at Rs. 25 per kg, he earns a profit of Rs.5 per kg.

The price at which he buys a thing is called its **cost price (C.P.)**.

The price at which he sells a thing is called its **selling price (S.P.)**

If S.P. > C.P. then he earns a **profit = S.P. – C.P**.

If S.P. < C.P. then he incurs a **loss = C.P. – S.P**.

S.P. and C.P. of the same number of items must be used to find profit or loss.

Example 3

A shopkeeper bought notebooks at Rs.100 per dozen and sold them at Rs. 10 each.

(a) What is the cost price of a dozen notebooks?

(b) What is the selling price of a dozen notebooks?

(c) Would the shopkeeper earn a profit or incur a loss.

(d) How much is his profit or loss per dozen notebooks?

The cost price of a dozen notebooks = Rs 100

The selling price of a dozen notebooks =Rs 12 × 10 = Rs.120

As. S.P. > C.P, he earned a profit.

Profit for a dozen notebooks = S.P. – C.P. = Rs.120 – Rs.100 = Rs.20.

Example 4

A fruit seller bought 10 dozen bananas at Rs. 12 per dozen. He sold 9 dozen of these at Rs 14 per dozen, the leftover bananas became soft and he had to sell them at Rs. 8 per dozen. How much profit or loss did he incur in all?

The cost price of bananas = Rs.10 × 12 = Rs. 120

The selling price of bananas = Rs. 9 × 14 + Rs. 8 × 1 = Rs. 126 + Rs. 8 = Rs. 134.

As. S.P. > C.P, he earned a profit.

Profit = S.P. – C.P. = Rs. 134 – Rs. 120 = Rs. 14.

Example 5

Suneel bought a Refrigerator for Rs.14,500, after a year he was transferred to another city; he sold the Refrigerator for Rs. 9,000. Did he earn a profit or loss and how much was it?

The cost price of Refrigerator = Rs.14,500

The selling price of Refrigerator = Rs. 9,000

As S.P. < C.P., Suneel incurred a loss on the Refrigerator.

Loss = C.P. – S.P. = 14, 500 – 9, 000 = Rs. 5,500.

Estimation

It is important in daily life to know how much money to take when you go shopping for certain things, quickly check your bill, how much tip to pay in a restaurant for a certain amount of a bill. It is called estimation. We can do it by rounding numbers and then adding and/or multiplying.

Activity 1

Strategies for estimation

To develop strategies for estimation, the teacher may ask students questions like the ones given below and ask students to do them mentally.Then ask those students that replied quickly how they did it.

1. A notebook costs Rs 5.50. Can you buy 4 of these if you have Rs 20? How did you decide?

2. You bought some fruits and vegetables from mother dairy whose prices came to Rs.15.25, Rs.14.30, Rs.31.75 and Rs.50.25. the salesman at the counter gave a bill for Rs.111.55. is the amount asked reasonable? How did you decide?
3. You are expected to tip about one-tenth of your bill in a restaurant. If your bill came to Rs 73, estimate how much tip you should pay?
4. You pay your maid Rs. 300 per month. If in a month she worked for 20 days, about how much should you pay her?
5. Eggs are Rs. 16 a dozen, if you have Rs. 10, do you have enough money to buy 9 eggs?

Exercise 6.2

1. A milk dairy buys milk from milkmen at the rate of Rs.13.50 per litre and sells at Rs. 15 per litre.
   (a) What is the cost price of milk?
   (b) What is the selling price of milk?
   (c) Will the dairy make a profit or incur a loss?
   (d) How much gain or loss would it incur per litre of milk?
   (e) If it sells 500 litres per day, how much gain or loss would the dairy incur?
2. Ram bought a watch for Rs.500. He sold it after a year for Rs. 350. How much gain or loss did he incur?
3. If you are given S.P. and profit, how would you find the C.P.?
4. If you are given C.P. and profit, how would you find the S.P.?
5. If you are given C.P. and Loss, how would you find the S.P.?
6. If you are given S.P. and Loss, how would you find the C.P.?
7. Fill in the entries in the table given below:

Cost Price.	Selling Price.	Profit
Rs 5.50	Rs.6	
Rs. 15		Rs.1.20
Rs.	Rs. 3000	Rs.350

8. Fill in the entries in the table given below:

Cost Price.	Selling Price.	Loss
Rs 100	Rs.90	
Rs. 1500		Rs.120
Rs.	Rs. 1500	Rs.350

9. A vegetable vendor bought 30 kg onions for Rs.360, if he wants to make a profit of Rs.60 on these, what selling price per kg he should fix for onions.
10. A man sold a house for Rs 1,80,000 and incurred a loss of Rs 35,000. How much did he pay for the house when he bought it?
11. How does a shopkeeper use mathematics in his daily work?
12. Write a report on how you use mathematics in your daily life and present it in class.

UNIT 7

Intervals of Time

The teacher can give a pretest(Q. 1-11 in Exercise 7) to ensure that the students can read and set a specific time on a clock.

Duration or interval of time

Watch the video: https://youtu.be/T4vH284t-_U

We often need to find the duration of an event starting and finishing at particular times. We can find these using a clock and count the hours and minutes the clock would have taken to move from one time to the other.

If the hour of start and finish of the event is the same, we count the minutes by subtraction.

If the hour of start and finish of the event is different, then we can find the minutes to the next hour, then find the hours from that to the hour of the time the event finishes and then the minutes past that and add all of them.

If the minutes are more than 60, we convert those to hours and minutes.

Example 1: The first period begins at 7:10 a.m. and ends at 7:50 a.m. How long is the duration of the period?

It will take the clock 40 minutes to move from 7:10 a.m. to 7:50 a.m., the duration of the period is 40 minutes.

Example 2: A movie starts at 12.30 p.m. and ends at 3:15 p. m., what was the duration of the movie?

Time from 12:30 p.m. to 1:00 p.m. = 30 minutes

Time from 1:00 p.m. to 3:00 p.m. = 2 hours

Time from 3:00 p.m. to 3:15 p.m. = 15 minutes

The total duration of the movie = 2 hours 45 minutes.

Example 3: A train starts at 2.15 p.m. from Delhi and reaches Ambala at 5:30 p.m., how long does it take to perform the journey?

Time from 2:15 p.m. to 3:00 p.m. = 45 minutes

Time from 3:00 p.m. to 5:00 p.m. = 2 hours

Time from 5:00 p.m. to 5:30 p.m. = 30 minutes

Total duration of the movie = 2 hours 75 minutes

= 2 hours + 1 hour and 15 minutes

= 3 hours 15 minutes.

Sometimes we know the starting time and the duration of the event and want the finishing time of the event. Then we add the hours and minutes to the time the event started to find out at what time the event would finish.

Example 4: The journey from Delhi to Saharanpur takes 4 hours and 30 minutes, at what time the train that started from Delhi at 3:40 p.m. will reach Saharanpur?

4 hours after 3:40 p.m. is 7:40 p.m.

30 minutes after 7:40 p.m. is 8:10 p.m.

Therefore, the train would reach Saharanpur at 8:10 p.m.

Exercise 7.1

1. Name the direction in which the hands move?
2. Name of the direction opposite to which hands of a clock move?
3. How much time does it take the minute hand to move from one dot to the next dot?
4. How much time does it take the minute hand to move from one number to the next number?
5. How much time does it take a minute hand to complete a full circle?
6. How much time does it take the hour hand to move from one number to the next.
7. Read the time shown on the clocks given below:

(a)

(b)

(c)

(d)

(e)

(f)

8. Write the following times in another way:
   (a) 4:10 (b) 5:30 (c) 8:45 (d) 9:15
9. If you want to set the times given below, tell where would you set the hour hand and the minute hand:
   (a) 4 o'clock (b) 5:30 (c) 8:45 (d) 4:32
10. What would you use-a.m. or p.m. to write the following times:
    (a) 7 in the morning
    (b) 4 in the evening
    (c) 9 at night
    (d) 10 in the morning
11. Would you use a.m. or p.m. after the times given below:
    (a) I get up at 6:00
    (b) I go to school at 7:15
    (c) Our school closes at 12:30.
    (d) I have my lunch at 1:10
12. What would be the time half an hour after the times given below:
    (a) 4 o'clock (b) 6:30 (c) 3:15 (d) 10:43

13. What would be the time 15 minutes before the times given below:
    (a) 10 o'clock (b) 2:30 (c) 9:45 (d) 6:52
14. What would be the time 40 minutes after the following times:
    (a) 5:00 a.m.
    (b) 4:40 p.m.
    (c) 9:15 p.m.
    (d) 11:50 a.m.
15. A shop opens at 10:00 a.m. and closes at 7:30 p.m. For how many hours is the shop open?
16. A TV programme begins at 4:05 and ends at 4:32, what is the duration of the programme
17. A Tennis match began at 9:15 a.m. and ended at 10:36, what is the duration of the match.
18. A movie is 2 hours 15 minutes long, if it began at 6:00 p.m., at what time it would end.
19. Give examples of situations where you need to find intervals in hours and minutes.

Duration in days

Some events last for days or months and days. A calendar is helpful in finding the intervals between specified **dates**.

A **date** is specified by a day, a month and a year.

We can write a date in several ways: e.g. 7^{th} April 2004; April 7, 2004; or 7.4.2004.

A calendar for the year 2021 is given below:

Calendar-2021

January 2021

S	M	T	W	Th	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February 2021

S	M	T	W	Th	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

March 2021

S	M	T	W	Th	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April 2021

S	M	T	W	Th	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May 2021

S	M	T	W	Th	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June 2021

S	M	T	W	Th	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July 2021

S	M	T	W	Th	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August 2021

S	M	T	W	Th	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September 2021

S	M	T	W	Th	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October 2021

S	M	T	W	Th	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November 2021

S	M	T	W	Th	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December 2021

S	M	T	W	Th	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

If the month is the same, we find the duration of the event by counting the days of the event from the calendar.

Example 1: Dussehra holidays start on 5th October and end on 17th October. How long are the Dussehra holidays?

We can either count up to 17 beginning with 5 which is 13 or find the days in October that are not holidays and subtract them from 17.

Days before October 16 that are not holidays – 4

Length of Dussehra holidays = 17 – 4 = 13 days.

If the month of start and finish is different for an event, we find the duration of the event by adding days until the last day of the month the event started, days in the months in between, and the days in the month the event finished.

Example 2: Gaurav went on leave on 16th May and joined office on 3rd July. How long was his leave?

Number of days in May he was not on leave = 15 days

Number of days he was on leave in May = 31 – 15 =16 days

Number of days he was on leave in June = 30 days

Number of days he was on leave in July = 2 days

Total number of days he was on leave = 16 + 30 + 2 = 48 days.

Example 3: A mela was to be held for 10 days, if it started on December 5, what would be its last day? Counting 10 days beginning with 5, we get to 14 December. Therefore, the last day of Mela would be 14 December.

Exercise 7.2

1. (a) How many days are there in a week?
   (b) Name the days of the week in order.
2. (a) How many months are there in a year?
   (b) Name the months of a year in order.
3. How many days are there in the following months?
   (a) January
   (b) May
   (c) June
4. Write the date today in two ways.
5. What is the date on the second Saturday of January?
6. We celebrate our independence day on 15 th August. Find the day of the week on which it would fall in the year 2021 from the calendar.
7. When is your birthday? Find the day of the week on which it would fall this year.
8. Ravindra worked from December 4 to December 11 in an Exhibition, how many days did he work?
9. Anita stayed from May 17 to June 10 in Bombay, how many days did she stay in Bombay?
10. The schools close for Christmas vacation for 10 days. If the vacations started on December 24, when will the schools reopen?
11. Give examples of situations where you need to find duration in days.

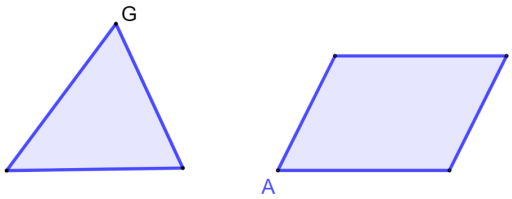
UNIT 8

Geometry

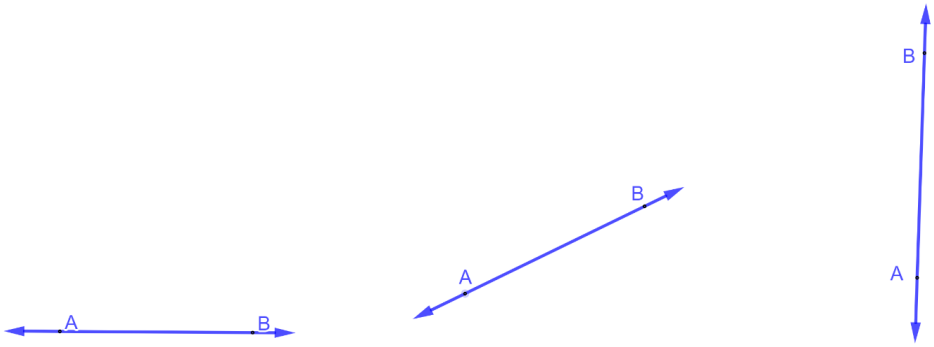
Basic geometrical concepts

Watch the video: https://youtu.be/k5etrWdIY6o

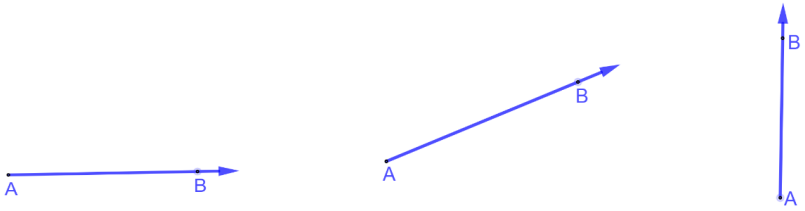
Point-A point gives a location. We represent a point by a dot(.) on a paper and label it by a capital letter of the alphabet. e.g. a corner of a chip, a corner of a polygon.We name a point by a capital letter e.g.A, B, C, L.



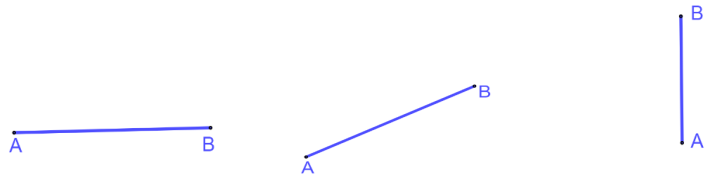
Line-A line is a straight line that extends infinitely(goes on and on endlessly) in both directions. We draw arrows at the end to indicate that it extends infinitely in both directions. We label a line by any two points A and B on the line with arrows in both directions.



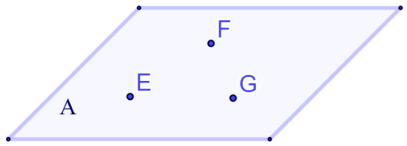
Ray-A ray is a line starting at a point and going on infinitely in one direction. We draw an arrow at the end that extends to infinity to indicate that it extends infinitely at that end. We label a ray by the point A from which a ray begins and another point B on it.



Line Segment-a line segment is a part of a line between two points A and B.

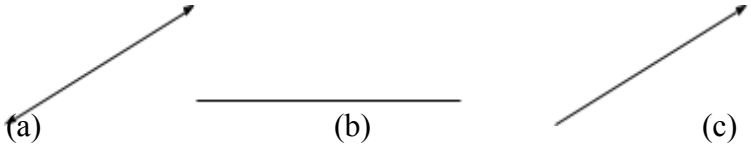


Plane-A plane is a flat surface that extends infinitely in all directions. A tabletop, a blackboard, a wall, and paper are all parts of a plane.
A plane is shown by a parallelogram and named by a capital letter or by three noncollinear points(the points that are not in a straight line) on the plane. For example, we will refer to the plane given below as plane EFG or plane A.



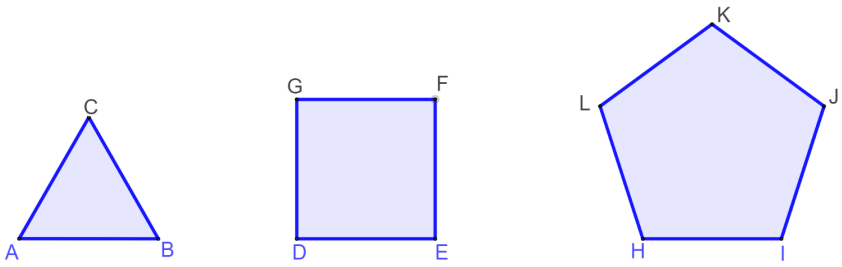
Exercise 8.1

1. Give examples of models that come close to the concept of a point in our environment.
2. Give examples of models of a line segment in our environment.
3. Give examples of models of part of a plane in our environment.
4. Identify the following as line segment, line, or ray.



(a) (b) (c)

5. Draw and label
   (a) 3 line segments
   (b) 3 rays
   (c) 3 lines
6. Name all the line segments in the figures given below:



(a) (b) (c)

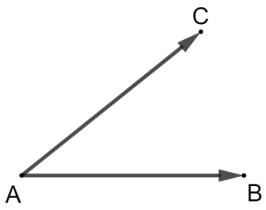
7. How do a line segment and a line differ?
8. How do a ray and a line differ?
9. How do a ray and a line segment differ?

Angle

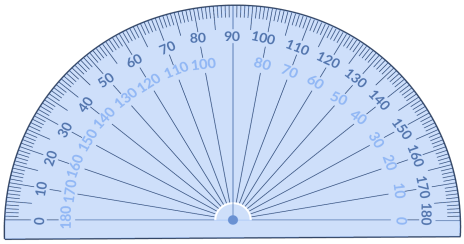
Watch the video: https://youtu.be/UgfSwlqi4Qg

Teacher can show by moving the minute-hands of a clock different angles formed by it with the hour-hand. Two rays AB and AC with the same initial point A form an angle. The rays are called the **sides/arms** of the angle. The common endpoint A is the **vertex** of the angle.

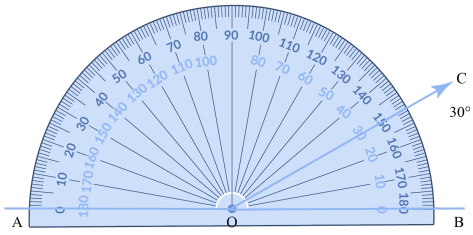
An angle is named ∠CAB with the name of the vertex in the middle.



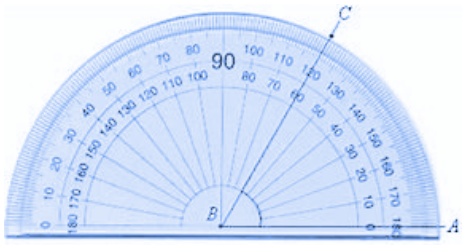
Measurement of angles-We use a semi-circular instrument called a **protractor** for the measurement of angles. It is divided into 180 parts and each part is called a degree and is written as $^\circ$. For example, an angle whose measure is forty degrees would be written as 40°. The measure of an angle A is 40° is denoted by $m\angle A = 40^\circ$.



For measuring an ∠BOC, keep the midpoint of the protractor called the **centre** on the vertex so that an arm of the angle coincides with the line on it and read the number of degrees on the protractor on the other arm. For example as the side OC is at 30°, the $m\angle BOC = 30^\circ$.

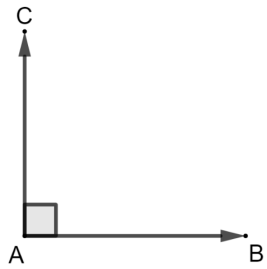


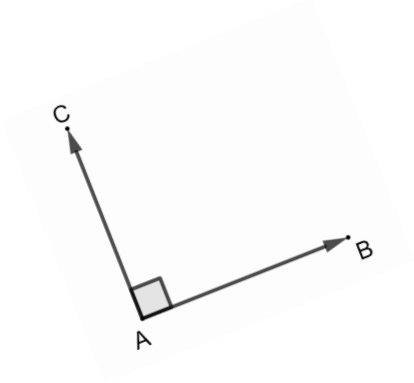
Drawing angles of a certain measure-Draw a line segment $\overline{OB}$ and then keep the centre of the protractor on the initial point O of the line segment so that $\overline{OB}$ coincides with the line on the protractor. Then mark a point C on the line that reads 60°, on the protractor to draw an angle of 60°. Remove the protractor and join AC. Then $m\angle COB = 60^\circ$.



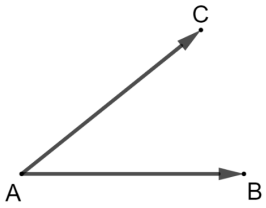
Types of angles-Angles are classified into right, acute, obtuse, reflex, straight, zero, and complete based on their measure:

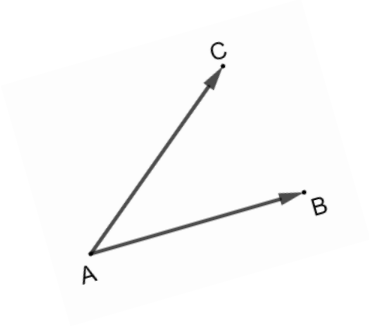
Right angle-An angle that has a measure of 90 ° is called a right angle **e**.g. corners of a paper, the angle that minute and hour hands of a clock make at 3 o'clock, angles of a square, the angle between a horizontal stick and a vertical stick laid on it, a corner of a paper, the drawings given below.



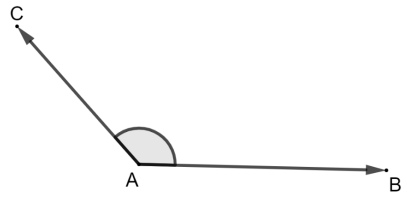


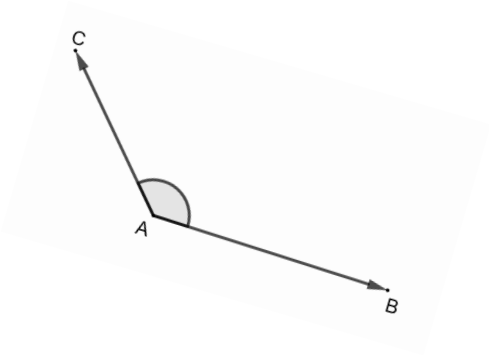
Acute angle- An angle whose measure is greater than 0 °and less than 90 ° is called an acute angle. An example is the drawing given below.



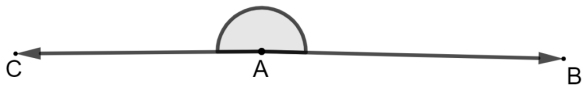


Obtuse angle- If the measure of an angle is greater than 90 ° and less than 180 °, then it is called an obtuse angle. An example is the drawing given below.

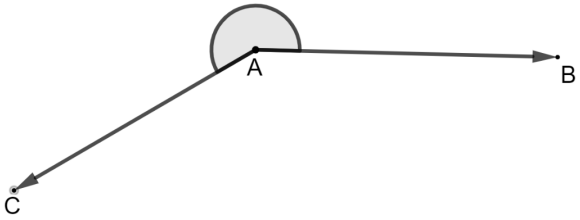




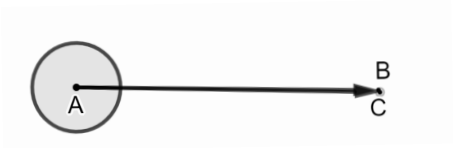
Straight angle-If the measure of an angle is 180 °, it is called a straight angle e.g. the angle that minute and hour hands of a clock make at 6 o'clock, angles made by two sticks when the starting point of the two sticks coincide and the sticks are laid opposite each other on a line.



Reflex Angle-An angle whose measure is greater than 180 °and less than 360 °is called a reflex angle. An example is the drawing given below.

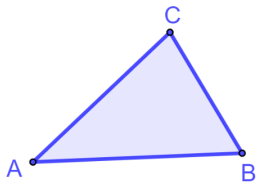


An angle of 0 °or 360 °- If the two rays are coincident, then the measure of the angle between them is 0 ° e.g. the measure of the angle that minute and hour hands of a clock at 12 o'clock, angles made by two sticks when one stick is laid over the other. It is also 360 ° because if we rotate one of the coincident sticks or minute hand by 360 °, it will coincide with the stick or minute hand would come back to the same position again.

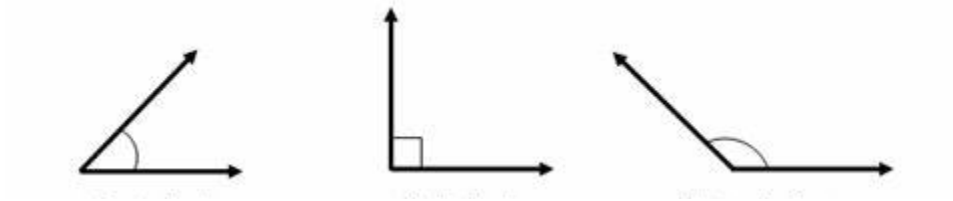


Exercise 8.2

1. Draw and label an angle.
2. Give 3 examples of angles in the environment.
3. Name all the angles of the figures given below:



4. Which of the following angles is
   (a) largest? (b) smallest?



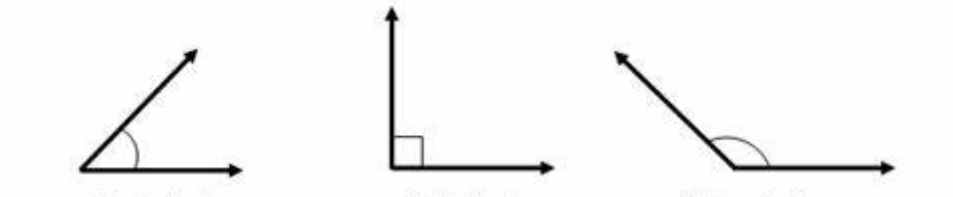
(a) (b) (c)

5. Give 3 examples of right angles in the environment.
6. Make the following type of angles by folding a paper or laying two sticks:

   (a) an acute angle (b) a right angle (c) an obtuse angle (d) 0°

   (e) a straight angle (f) a reflex angle (g) a straight angle (h) 360°

7. Make a model of the right angle with paper or use the right-angled corner of a set square in your geometry box to classify the following angles as right, acute, or obtuse.



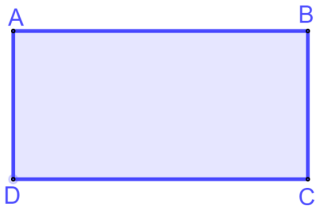
(a) (b) (c)

8. Classify the angles made by the minute hand and hour hand in the following clocks as acute, obtuse, or right angles:

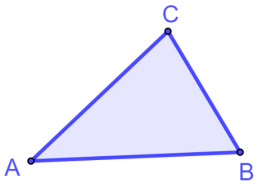
(a) (b) (c)

9. What is the angle between the east and north directions
10. What is the angle between the east and west directions?

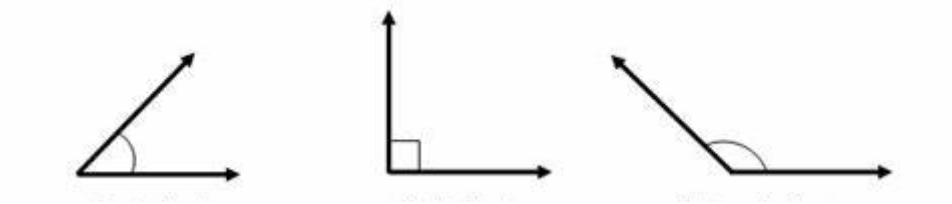
11. What kind of angle do the minute hand and hour hand make at the following times
    (a) 3 o'clock (b) 6 o'clock (c) 12 o'clock
12. Name all the angles of the rectangle given below and state the kind of angles they are.



13. Name all the angles of the triangle given below and state what kind of angles they are:



14. Draw the following type of angles:
    (a) an acute angle (b) an obtuse angle (c) a right angle (d) a straight angle
    (e) a reflex angle
15. Find the measures of angles given below:



16. Draw angles whose measures are given below:

    (a) 90° (b) 60° (c) 45° (d) 73° (e) 105°

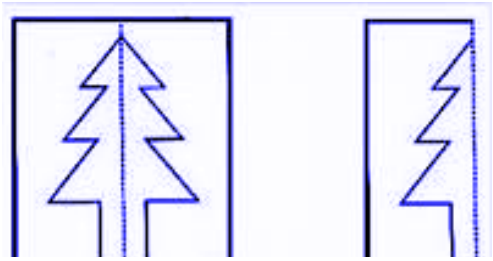
    (f) 256° (g) 180° (h) 300° (j) 360° (k) 0°

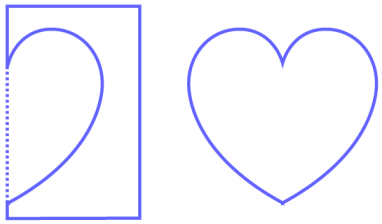
Symmetry

Watch the video: https://youtu.be/MtqtIiJsfiE

Line Symmetry-If a picture can be folded along a line so that the two parts cover each other exactly, then the picture is said to be symmetrical and the line is called the line of symmetry.

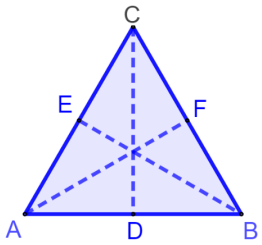
We can make symmetrical drawings with the crease as a line of symmetry by folding a paper and drawing a figure along the fold and cutting it, when you unfold it you will get a symmetrical object with the fold as a line of symmetry.

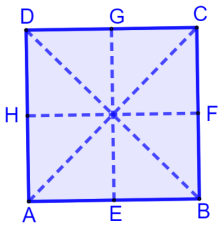


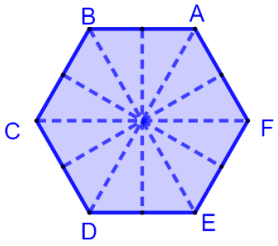


We can also find lines of symmetry of geometrical figures by tracing and cutting them and folding them so that the two halves cover each other exactly.

The dashed lines in the figures given below are lines of symmetry.







Rotational symmetry

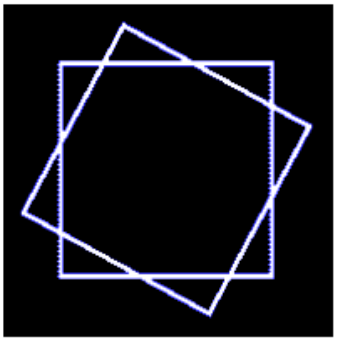
Watch the video: https://youtu.be/s4tS-ZmpJfw

We have rotational symmetry if we can turn a shape around a point (centre of the figure) into one or more different positions during one complete turn that looks exactly the same. The number of different positions in which it is exactly the same as the original figure is called the **order of rotational symmetry**.

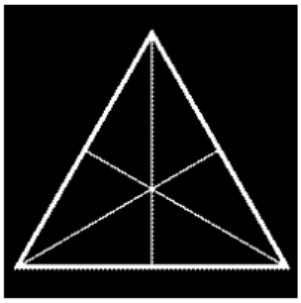
Activity 8.1

Find the centre of the square by drawing line segments that join the opposite corners, where they meet is called the centre of the square.

Trace the square given below; copy its outline on a tracing paper. Now you have two identical squares. Keep the tracing paper on the original square so that it fits it exactly. Hold a pin in the centre with one hand and turn the tracing paper slowly and count the number of positions in a complete turn, where it fits again. You would have noticed 4 positions in which it covered the original figure exactly. Thus the order of rotational symmetry is 4.



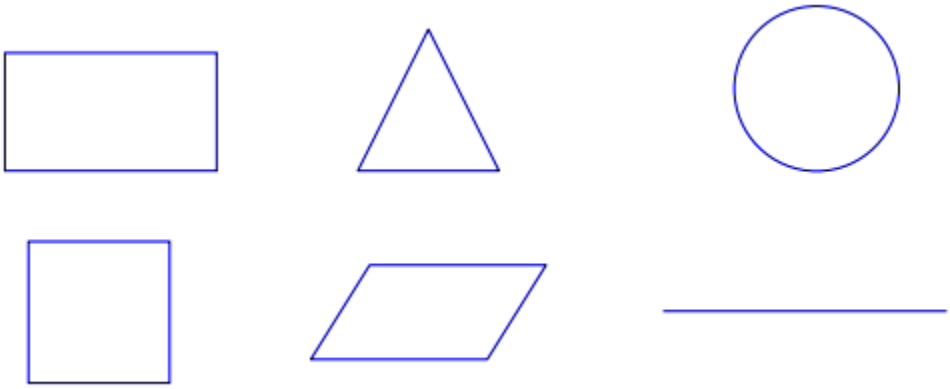
Now repeat with the equilateral triangle given below. You can find the centre of the triangle by joining the midpoint of 2 sides to the opposite vertex.
What is the order of rotational symmetry of an equilateral triangle?



Now do the same with the star given below using the centre of the circle.
How will you find the centre of the circle?
What is the order of rotational symmetry?

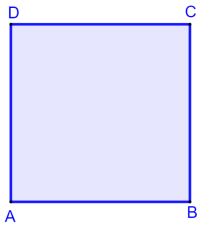
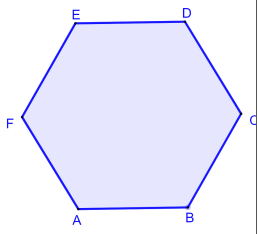
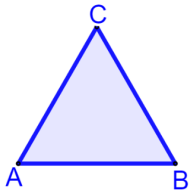
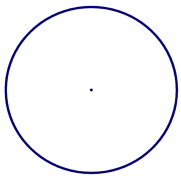
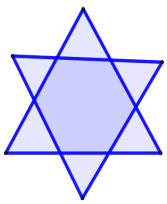
Exercise 8.3

1. Draw a square, a rectangle, and a line on a dot paper and draw all lines of symmetry in them.
2. Trace and cut the pictures given below and find all lines of symmetry by folding these.



3. Draw the following angles and cut along the arms of the triangle and fold them to find their lines of symmetry:
   (a) a right angle (b) an acute angle (c) an obtuse angle
4. Which of the following figures are symmetrical?

5. Find some pictures of objects that are symmetrical, paste them in your notebook, and draw lines of symmetry in those.
6. Make some symmetrical shapes by folding a piece of paper into two halves, drawing shapes adjacent to the fold, and cutting them out. Paste these in your notebook.
7. Fill in the following table for line symmetry and rotational symmetry of the shapes given below:

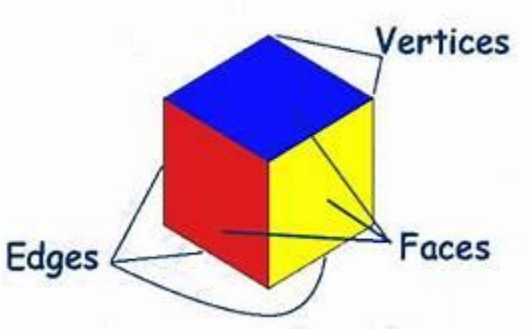
	Shape	Number of lines of symmetry	Order of rotational symmetry
(a)		4	4
(b)			
(c)			
(d)			
(e)			

8. Fill in the following table for line symmetry and rotational symmetry of the letters given below:

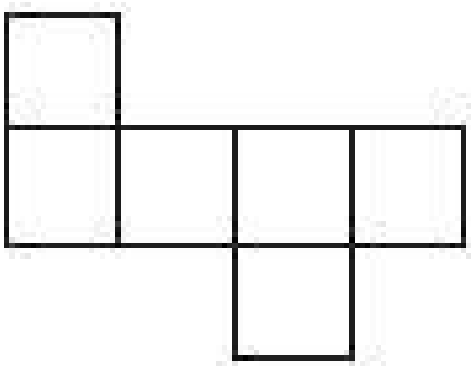
	Shape	Number of lines of symmetry	Order of rotational symmetry
(a)	O		
(b)	H		
(c)	S		
(d)	A		
(e)	E		
(f)	I		

3-D Figures

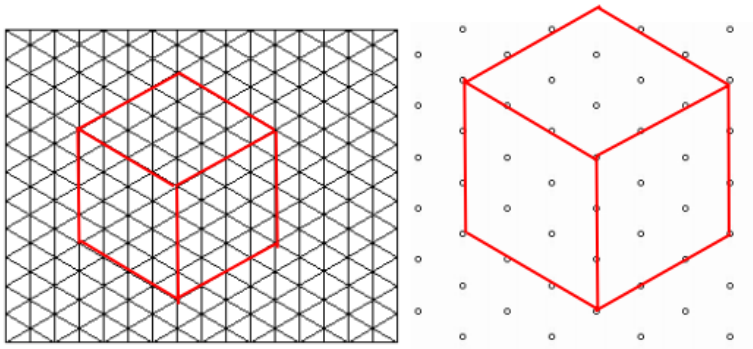
A three dimensional figure has length, breadth and height. We can describe a 3-D figure by parts.
A **face** is a flat side.
A **base** is a face on which the figure sits.
An **edge** is where 2 faces meet.
A **vertex** is where 3 or more faces meet.



Making objects by folding their nets-A two-dimensional figure that can be cut out and folded in a three-dimensional box is called a **net**.
Nets for a cuboid, cylinder, and cone are given in Activity sheets 8.1, 8.2, and 8.3 respectively.
Print these and fold and join the edges to make a cuboid, cylinder and cone.
Make a net for a cube. How many edges, faces, and vertices does it have?
We can draw its nets on graph paper that will fold into a cube.
For example, the figures given below can be folded into a six-face cube.

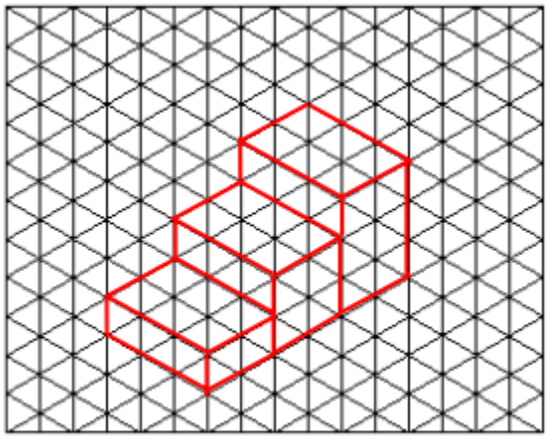


Make more nets, cut and fold them to check whether they will fold into a cube or not.
Work in small groups to find out how many different nets (a net that cannot be obtained by flipping or rotating another net) can be made. (Eleven nets are possible.)
Draw 3-D objects in 2-D-We can draw 3-D objects in 2-D by using an **isometric triangular grid or dot paper** given in Activity Sheets 8.4 and 8.5.
The figure given below shows a cube drawn on them.

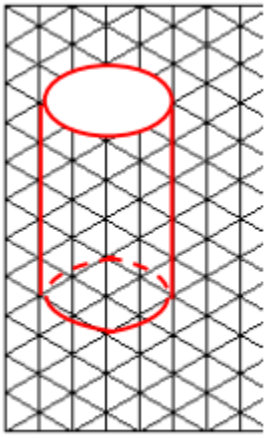


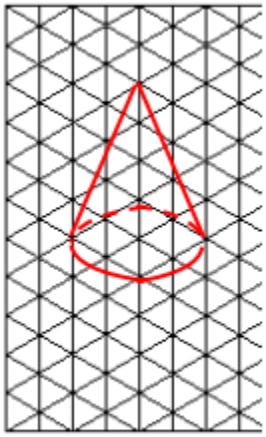
Isometric triangular graph paper Isometric triangular dot Paper

We can use an isometric grid to draw some other shapes also e.g. stairs.



For Some figures we need to use curved portions e.g. circles in drawing a cylinder and cone. We can draw these as shown below. The dashed lines show the parts we can”t see.





Symmetry in 3-D shapes

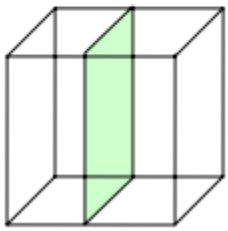
Plane of reflectional symmetry

Watch the video: https://youtu.be/nmr46D5Cy9E

As 2-D figures have lines of reflectional symmetry, 3-D shapes have planes of reflectional symmetry.

A plane is a plane of reflectional symmetry if it can slice the shape into two equal halves which are mirror images of each other.

A hot-wire cutter can be used to cut a styrofoam model into two such solids. The path of hot wire shown by the shaded part is the plane of reflectional symmetry.



Rotational Symmetry

Watch the video: https://youtu.be/Ch95sES5D9A

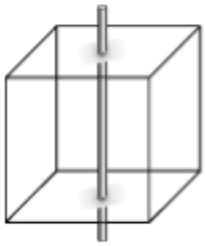
Axis of rotational symmetry

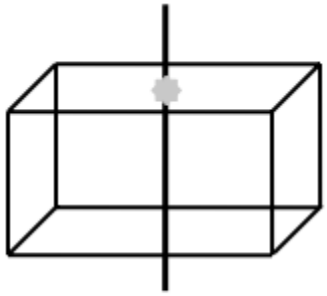
As 2-D figures have lines of reflectional symmetry, 3-D shapes have axes of rotational symmetry.

A 3-D figure has rotational symmetry if we can turn a shape around a line(axis of symmetry) into one or more different positions during one complete turn that looks exactly the same. The number of different positions in which it is exactly the same as the original figure is called the **order of rotational symmetry** of the 3-D figure.

Place a wire in a vertical position at the centre of the upper face of the figure and rotate the 3-D figure about it. The number of different positions during one complete turn that looks exactly the same is its order of rotational symmetry.

One axis of rotational symmetry for a cube and cuboid are given below.





Exercise 8.4

Activity 1

Make nets for the following 3-D objects:
(a) A cube
(b) A cylinder

Activity 2

Draw the following figures on the isometric dot or grid paper given in Activity Sheets 8.4 and 8.5 respectively:
(a) A cuboid
(b) A cylinder.
(c) A stair with four steps.
(d) A cone.

Activity 3

Draw the following figures and draw a plane of reflectional symmetry in them:
(a) a cube (b) a cuboid (c) a cylinder (d) a cone
How many planes of reflectional symmetry do the following figures have?
(a) a cuboid (b) a cylinder (c) a cone

Activity 4

Draw the following figures and draw an axis of rotational symmetry in them:
(a) a cuboid (b) a cylinder (c) a cone

UNIT 9

Weight and Volume

Weight

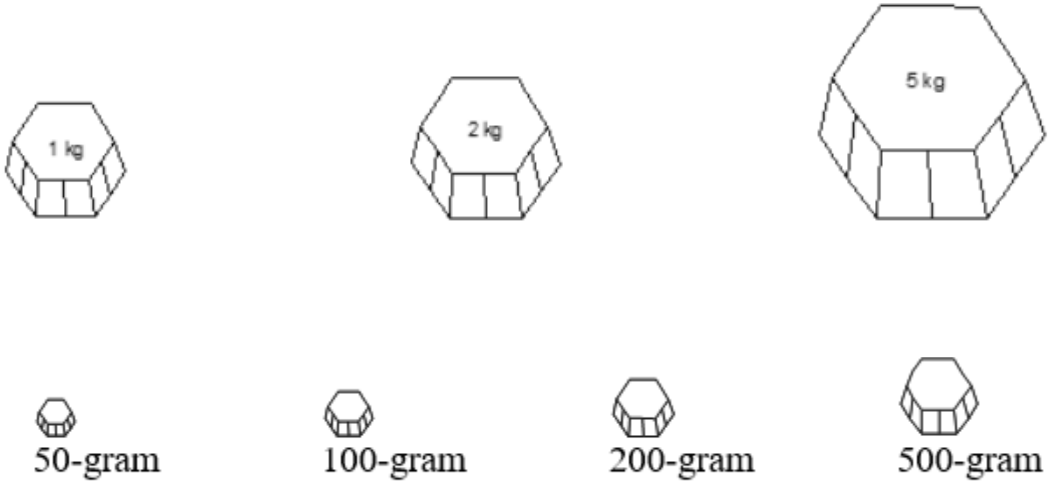
Watch the video: https://youtu.be/ZFL1IUNWUZQ

You would have seen a vegetable vendor or grocer weighing things with a balance and set of weights. He goes on adding and removing weights until the balance does not tilt to a side.

A balance and standard weights(approved by the government) are used for measuring weight.

The weight is measured in kilograms(kg) or grams

Some commonly used standard weights are given below:



1 kilogram(kg) = 1000 grams(g).

We can convert kilograms to grams by multiplying kilograms by 1000 e.g

4 kg = 4×1000 = 4000 g.

We can find fractional parts of kg by converting it into grams and dividing the number of grams by denominator of the fraction e.g.

$\frac{1}{2}$kg = $\frac{1}{2} \times 1000 = 500\ g.$ $\frac{1}{4}$kg = $\frac{1}{4} \times 1000 = 250\ g.$

We can convert grams to kilograms by dividing grams by 1000 e.g.

6000 g = 6000÷1000 = 6 kg

500 g = $\frac{500}{1000}$kg = $\frac{1}{2}$kg

250 g = $\frac{250}{1000}$kg = $\frac{1}{4}$kg

If we need both kilogram and gram weights to weigh an object, we report it in kilograms and grams e,g, 3 kg and 200 g.

We can convert kilograms and grams to grams by multiplying the kgs by 1000 and adding grams to it e.g. 2 kg and 400 g = 2×1000 + 400 = 2400 gm.

You can convert any number of grams greater than 1000 grams by reporting the last 3 digits as grams and the digit before them as kilograms. For example, 43,500 gm = 43 kg and 500 g.

Rounding kilograms and grams to the nearest kilogram.

If the number of kilograms is large, we may round the number of kilograms and grams to the nearest kilogram.

If the number of grams is 500 or more, we round the kilograms to the next number of kilograms and if the number of grams is less than 500 grams, we ignore the grams. For example, we will report 400 kilograms and 800 grams as 401 kilograms and 356 kilograms and 300 grams as 356 kilograms.

Exercise 9.1

1. How many grams are there in one kilogram?
2. Convert the following to grams:
   (a) 2 kg = _____
   (b) 5 kg = _____
   (c) 4 kg 500 gm = _____
   (d) 1 kg 250 gm = _____
   (e) 3 kg 50 gm = _____
3. Would you use kilograms or grams for measuring the weight of the objects given below?
   (a) a watermelon _____
   (b) a gold bangle ____
   (c) a packet of a spice ____
   (d) a big bag of apples ____
4. Give situations in daily life where we need to find the weight of an object.
5. The price of tomatoes is Rs 16 per kg, what would be the cost of
   (a) $\frac{1}{4}$ kg of tomatoes
   (b) $\frac{1}{2}$ kg of tomatoes
   (c) 5 kg of tomatoes
6. Fill in the appropriate number in the box:
   (a) 500 g = $\frac{1}{\square}$kg
   (b) 250 g = $\frac{1}{\square}$kg
   (a) 750 g = $\frac{3}{\square}$kg
7. The cost of 5 kg of rice is 250 rupees, what will be the cost of
   (a) 1 kg of rice?
   (b) 3 kg of rice?
   (c) 500 g of rice?
   (d) 250 g of rice?
8. Round the following to nearest 100 grams:
   (a) 420 g
   (b) 275 g
   (c) 1 kg and 230 g

Volume

Watch the video: https://youtu.be/HuwKlGpzqB8

The amount of liquid a container can hold is called its **capacity**.

The amount of liquid in a container is called its **volume**.

Use of equal sized marbles for calibrating a jar in terms of number of marbles using water displacement

Take a jar with little water and mark its level with a grease pencil. Add a marble/a number of marbles to it), the water rises a bit, mark the new level. Keep on adding marbles/the same number of marbles and marking the new level after each addition of marbles. Remove the marbles from the water and add a few drops of water to return to the level of the starting point. Now we have a series of marks on the side of a jar that corresponds to the volume of water displaced by various numbers of marbles. We can now find the volume of various objects in terms of marble units.

However, as sizes of marbles may differ, we need standard units.

The standard units for measuring volume are litres(l) and millilitres(ml).

1 litre = 1000 millilitres.

We measure volume of liquids by jars calibrated in millilitres(ml).

We can measure the volume of irregularly shaped objects such as decoration pieces, stones by dropping them in a calibrated cup or jar with some water in it and noting down the difference in level of water.

The amount of liquid in a container can be measured by measuring cups.

The liquids we buy from the market come in containers that have the capacity of those containers marked on them.

Some containers and measuring cups with different capacities and are given below:

We can convert litres to millilitres by multiplying litres by 1000 e.g
4 l = 4×1000 = 4000 ml.

We can find fractional parts of litres by converting it into millilitres and dividing the number of millilitres by the denominator of the fraction e.g.

$\frac{1}{2}$l = $\frac{1}{2}$×1000 = 500 ml.

$\frac{1}{4}$l = $\frac{1}{4}$×1000 = 250 ml.

We can convert millilitres to litres by dividing ml by 1000 e.g.

8000 ml = $\frac{8000}{1000}$ = 8 l.

If we need both litres and millilitres to find the volume of amount of liquid in a container we report it in litres and millilitres e.g. 2 l and 400 ml.

We can convert litres and millilitres to millilitres by multiplying litres by 1000 and adding millilitres to it e.g. 4 l and 300 ml = 4×1000 + 300 = 4300 ml.

You can convert any number of millilitres greater than 1000 ml by reporting the last 3 digits as millilitres and the digits before them as litres. For example, 35,500 ml = 35 l and 500 ml.

Rounding litres and millilitres to nearest litre.

If the number of litres is large, we may round the number of litres to the nearest litre.
If the number of millilitres is 500 or more, we round it to the next number of litres and if less than 500 ml, we ignore the millilitres. For example, we will report 500 litres and 900 millilitres as 501 litres and 866 litres and 200 millilitres as 866 litres.

Exercise 9.2

1. Give situations in daily life where we need to find the amount of liquid in a container?
2. How would you compare the capacity of two containers 1 and 2 with different shapes?
3. What units are used for measuring the capacity of a container?
4. How many millilitres are there in one litre?
5. Name 2 things you buy in litres.
6. Name 2 things you buy in millilitres.
7. Convert the following to millilitres:
   (a) $\frac{1}{4}\ l$
   (b)$\frac{1}{2}\ l$
   (c) 3 l
8. Would litre or millilitres be used for how much liquid is in the containers given below:
   (a) a bottle of a medicine
   (b) a big can of oil
   (c) a small bottle of cold drink
   (d) a tube of toothpaste
9. Approximately how many ml would a teacup hold?
   Select the correct answer.
   A. 2 ml
   B. 20 ml
   C. 200 ml.
10. Give a combination of measures of 50 ml, 200 ml, 500 ml and 1 l to measure the following amounts of a liquid using a measure once only.
    (a) 500 ml (b) 150 ml (c) 1l and 500 ml (d) 350 ml
11. A bottle of 100 ml of a tonic costs Rs 50
    (a) What would be the cost of 200 ml of the same tonic?
    (b) If a bottle of 200 ml of tonic costs Rs 95, how much money would you save by buying the 200 ml bottle of tonic?
12. If you have two containers that can hold 8 litres and 5 litres. Describe how you can measure the amounts of water given below:

(a) 3 litres

(b) 10 litres

(c) 2 litres

UNIT 10

Perimeter, Area and Volume

Perimeter

Watch the video: https://youtu.be/AAY1bsazcgM?t=5

Distance around a figure or shape is called its perimeter.

We often need to find it in daily life e.g. if we want to stitch a lace around a table cloth, how much lace to buy.

If the figure is a polygon, that is a closed figure made up of line segments it can be found by measuring the length of all the sides with a ruler and adding them.

We can also use the properties of figures to find their perimeter.

For example, we know that a square has four sides, and the length of all its sides are equal. So we can measure the length of one of its sides and multiply it by 4 to find its perimeter p. Such a rule is called a **formula**.

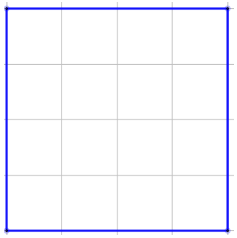
The formula for finding the perimeter of a square is $p = 4 \times s$

Similarly, we know that the length of opposite sides of a rectangle are equal. We can measure its length l and breadth b, add the two and double the sum to find its perimeter$p$.

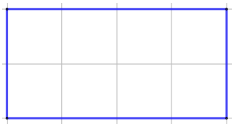
The Formula for finding the perimeter of a rectangle is $p = 2 \times (l + b)$.

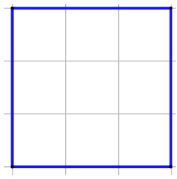
Drawing figures with a given perimeter on graph paper

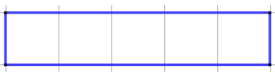
We can also draw figures with a given perimeter on graph paper by using these properties. For example, to draw a square whose perimeter is 16 units, we can find the side of the square by dividing 16 by 4 and then draw it. The square given below is drawn with its side equal to 4 units where the length of a small square is 1unit.



Similarly to draw a rectangle whose perimeter is 12 units, we divide 12 by 2 to find the sum of its length and breadth and then any rectangle whose length and breadth has a sum of 6. There will generally be more rectangles with this parameter e.g. all rectangles whose length and breadth are 3, 3; 4, 2; 5, 1 would have a perimeter of 12. All the rectangles given below have a perimeter of 12 units.







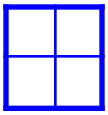
The perimeter of curved and irregular shapes
If the shape is curved or irregular e.g. the shapes given below:

We cannot measure it with a ruler. However, we can mark a point on it and keep an end of a thin string or wool there, take it around the figure keeping it on the line until we come back to the same point. Cut the string or wool and measure the length of the string. That gives the parameter of the figure. (Teacher may demonstrate it.)

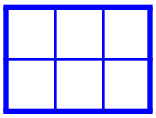
Exercise 10.1

1. Give situations in daily life where you need to find the perimeter.
2. Find the perimeter of the figures given below taking the length of a small square as a unit:

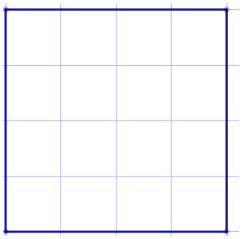
(a)



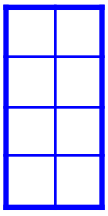
(b)

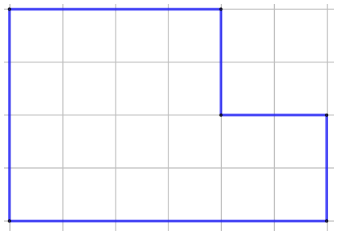


(c)



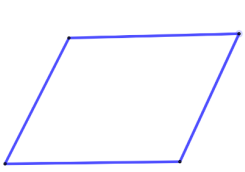
(d)



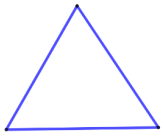


(e)

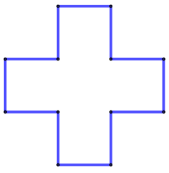
3. Measure the length of sides of the figures given below and find their perimeter.



(a)

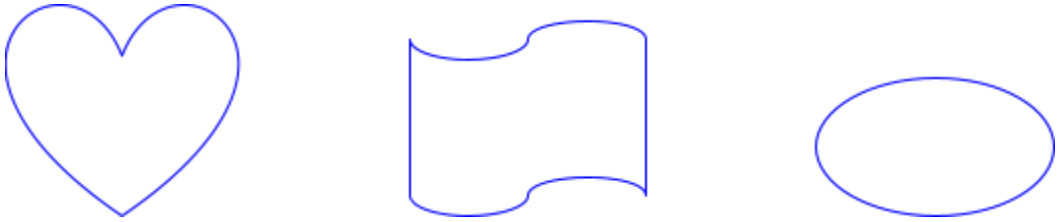


(b)



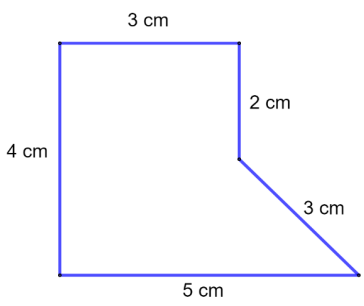
(c)

4. Draw the following figures on graph paper taking the length of a small square as a unit and find their perimeter:
   (a) A square whose side is 3 units.
   (b) A rectangle whose length is 5 units and breadth is 3 units.
5. Draw the following figures on the graph paper taking the length of a small square as a unit so that they have the given perimeter:
   (a) A square whose perimeter is 12 units.
   (b) A square whose perimeter is 16 units.
   (c) A rectangle whose perimeter is 12 units.
   (d) A rectangle whose perimeter is 6 units.
6. Find the parameter of the following figures with the help of a string:

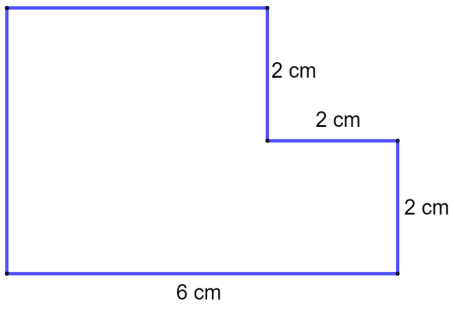


(a) (b) (c)

7. Anurag ran around a rectangular field whose length is 150 metres and breadth is 100 metres. How much distance did he run if he ran
   (a) 1 round? (b) 4 rounds?
8. The side of a square baby sheet is 1.25 metres. You want to fix a lace around it, how much lace should you buy?
9. Find the parameter of the following figures:



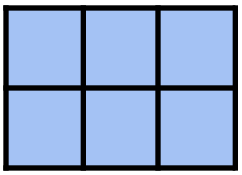
(a)

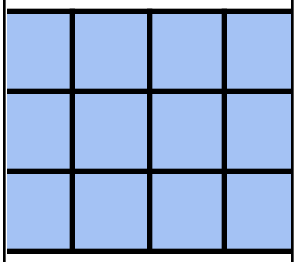


(b)

Area

Watch the video: https://youtu.be/xCdxURXMdFY
Ask questions such as the following
Which wall would require more paint this or that.
Can I cover the entire table with this paper?
Can I write more on this paper or that?
Comparisons such as these will give an intuitive feeling of the area and comparison of areas.
The amount of surface is called an area.
We often need to find the area e.g. to find out how much sun mica to buy to cover a tabletop. We can measure the amount of a surface by covering the surface with graph paper in which the area of a square is 1 unit and count the number of squares.
The area and perimeter would vary as the size of the square on the grid.
Thus we need a standard unit to measure the amount of surface. We use the surface covered by a square whose side is 1mm//1m. The unit is called 1 square millimetre(1 mm^2)/1 square centimetre(1 cm^2) or 1 square metre(1 m^2).
1 m^2 = 1 m×1 m= 100 cm ×100 cm = 1,00,000 cm^2
1 cm^2= 10 mm ×10 mm = 100 mm^2
We can again find rules or formulae to find the area of regular figures. We will restrict to the area of squares and rectangles in this book.
Verify the entries in the table given below:

Rectangle	Length in centimetre	Breadth in centimetre	Area in square centimetres
	2	1	$2 \times 1 = 2$ unit^2
	3	2	$3 \times 2 = 6$ unit^2

	4	3	$4 \times 3 = 12$ unit^2

The table shows that we can find the area(A) of a rectangle by multiplying its length(l) and breadth(b).

$A = l \times b$, where l is the length and b is the breadth of sides of a rectangle.

Always use the same units e.g.m, cm, mm or units, for length and breadth.

Always write the units after the area e.g. mm ^{2}, cm ^{2}, m ^{2} or units ^{2}.

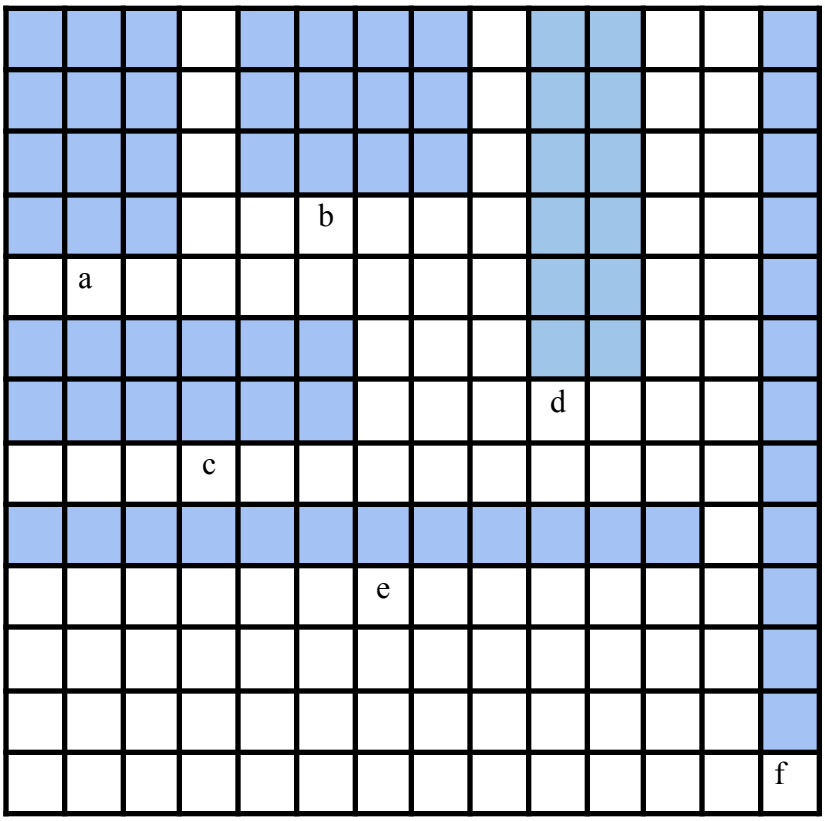
As the length and breadth of a square are equal, the formula for the area of a square is

$A = s \times s$ where s is the length of a side of the square.

Drawing rectangles whose area and perimeter are given

We will illustrate it with an example. Draw a rectangle whose area is 12 square centimetre and whose perimeter is 14.

Given an area say 12 square centimetres, we can draw many rectangles that would have the same area. All the rectangles given below have an area of 12 square centimetres.

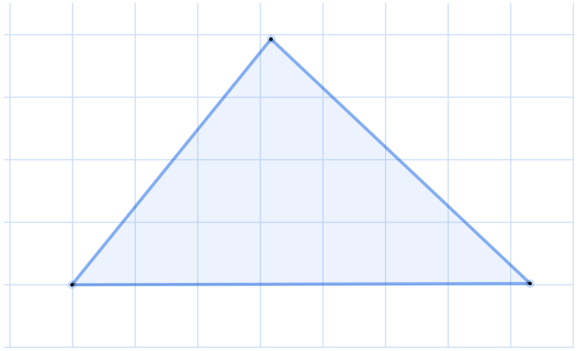


However, the perimeter of all of these is different viz. 14, 14, 16, 16, 26 and 26.
So we will choose (a) or (b). In these only the length and breadth are interchanged, but the perimeter and area is the same.
Thus the orientation does not matter.
Henceforth we will draw only one of these.
What property of numbers does it show? (The order of numbers in addition and multiplication does not matter.)

Area of irregular shapes

To find the area of irregular figures, keep them on a grid where each small square represents one unit and draw a line around them. Get an inner measure by counting the whole squares inside the figure and an outer measure by counting all squares that touch the figure anywhere. The area lies between these two measures. We take its estimate as the average of the two that is (inner measure + outer measure)/2.

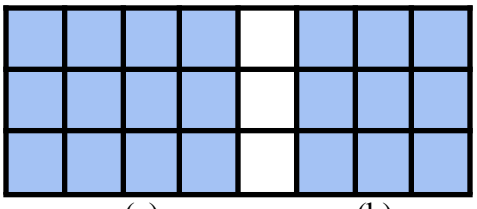
The inner and outer measure of the area of the triangle are 9 square and 19 squares respectively.Therefore its estimate is (9+19)/2 = 14 unit ^{2}.



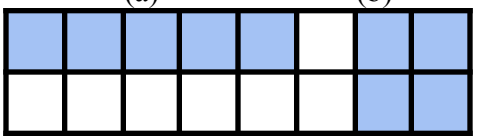
If the difference between the inner and outer measure is too large, we can use a smaller grid to get a better estimate.

Exercise 10.2

1. Give situations in daily life where we need to find the area.
2. Find the area of the figures given below:

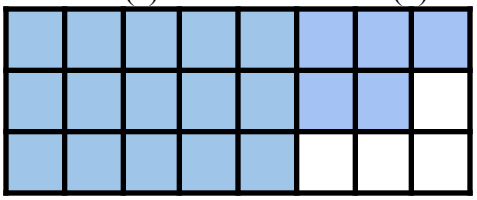


(a)



(b)

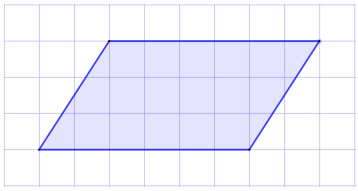
(c)



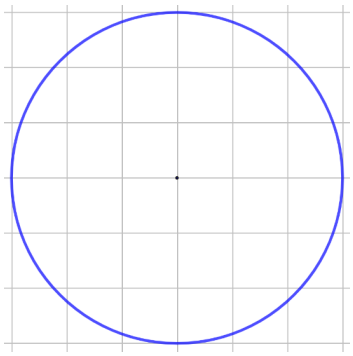
(d)

(e)

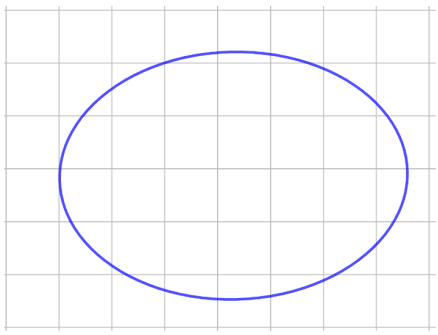
3. Taking a small square as a unit of area, draw all rectangles on graph paper whose area in units is given below: (you don't need to draw rectangles that have a different orientation)
   (a) 6 unit^2 (b) 10 unit^2 (c) 5 unit^2
4. Find areas of rectangles in units^2 whose length and breadth are given below:
   (a) Length = 4 units and breadth = 3 units
   (b) Length = 2 units and breadth = 5 units
5. Find the area of squares whose sides are given below:
   (a) 4 units (b) 3 units
6. Estimate the area of figures given below, the area of a square is 1 unit.
   (a)



(b)



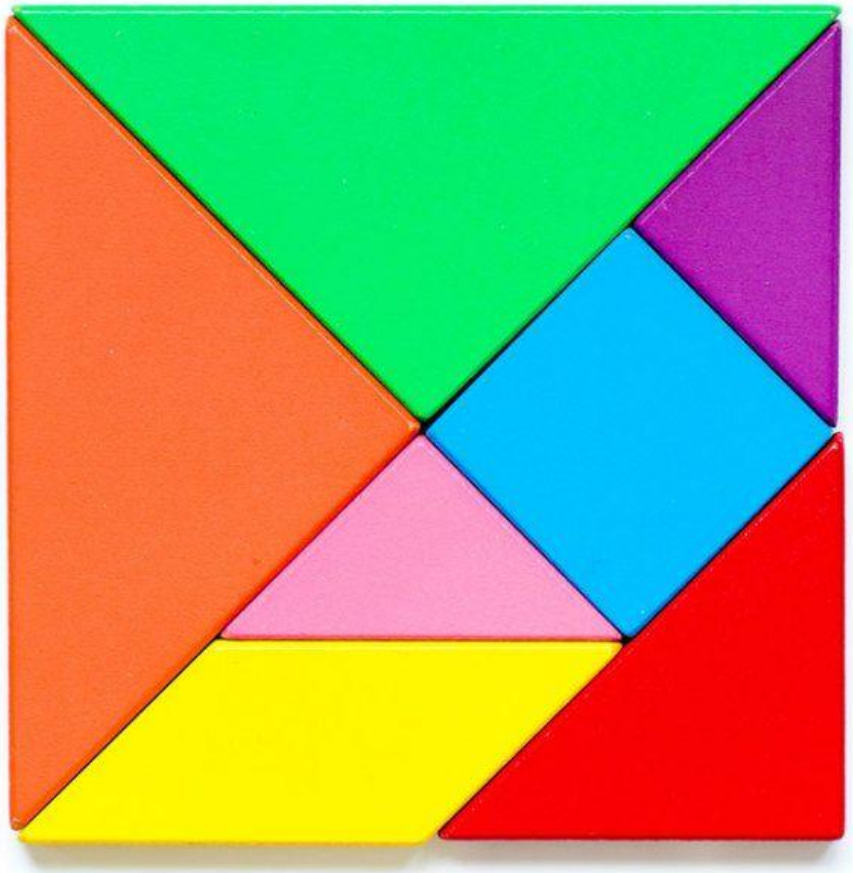
(c)



7. Draw a square and cut it into two pieces.
   (a) Would the sum of their perimeters be the same as that of the original square?
   (b) Would the sum of their areas be the same as that of the original square?
8. Taking the length of a small square as a unit of length and its area as a unit of area, shade rectangles on a graph paper whose area and perimeter and are given below:
   (a) Area 1 unit and perimeter 4 units
   (b) Area 4 units and perimeter 8 units
   (c) Area 4 units and perimeter 10 units
   (d) Area 6 units and perimeter 10 units
   (e) Area 20 units and perimeter 18 units
9. Tanya wants to make a quilt using her 30 square pieces. How should she arrange her pieces so that the lace required would be minimum?
10. How many square tiles whose side is 20 cm would be needed for a room whose length and breadth are 5 metres and 4 metres respectively.
11. Collect some objects e.g. leaves, coins, CDs, and find the area of their faces using graph paper.

Activities with Tangram

A **tangram** is an old Chinese puzzle and consists of seven tangram pieces that form a square. A tangram is given below:



This tangram is given in Activity sheet 10.3. You can remove/print it and cut it into 7 pieces.
If the pink triangle is taken as a unit of area and find the area of the following figures:
(a) Blue square (b) Red triangle (c) Yellow parallelogram
(d) Green Triangle (e) The big square made from tangram pieces.
In Q. 2-9, let the square tangram piece represents one unit of area
Make a square with the two small triangles. What is the area of this square? How do you know?
What is the area of the small triangle used? How do you know?
Make a (non-square) parallelogram with the two small congruent triangles. What is the area of this parallelogram? How do you know?
Make a triangle with the two small congruent triangles. What is the area of this triangle? How do you know?
Make a square with a medium-sized triangle and two small congruent triangles. What is the area of this square? How do you know?
What is the area of the medium triangle? How do you know?
Make a rectangle with the parallelogram and the two small congruent triangles. What is the area of this rectangle? How do you know?

What is the area of the larger triangle? How do you know?
Make a square with the two large congruent triangles. What is the area of this square? How do you know?
Make a square with all the pieces. What is the area of this square? How do you know?

Volume

Watch the video: https://youtu.be/rMNHY08GqC4

Suppose you were packing a football and a cricket ball in a box, which would occupy more space?

The space that an object occupies is called its volume.

Measurement of volume

We use graduated measuring cups with markings in millilitres.

1 litre = 1000 millilitres

The volume of liquids is measured in litres or millilitres.

Measuring volume of a cuboid(rectangular prism) with counting cubes

We can estimate the volume by filling a container with unit cubes whose length, breadth and height is one unit. If the length, breadth and height of a cube are one unit or centimetre, the volume of a cube is one cubic centimetre or units ^{3}. If the length, breadth and height are one metre, the volume is one cubic metre(m ^{3}).

1 m ^{3}= 1 m × 1m × 1 m = 100 cm × 100cm × 100 cm = 10,00,000 cm ^{3}

Fill a rectangular box with unit cubes without leaving any holes (We will restrict to the case where the dimensions of the box are whole units). The number of cubes that can be filled in the box is its volume in cubic centimetres or unit ^{3}

For example, if you cut the grid with the thick border given below, fold it along the dotted line, and join the borders, you will have an open box.

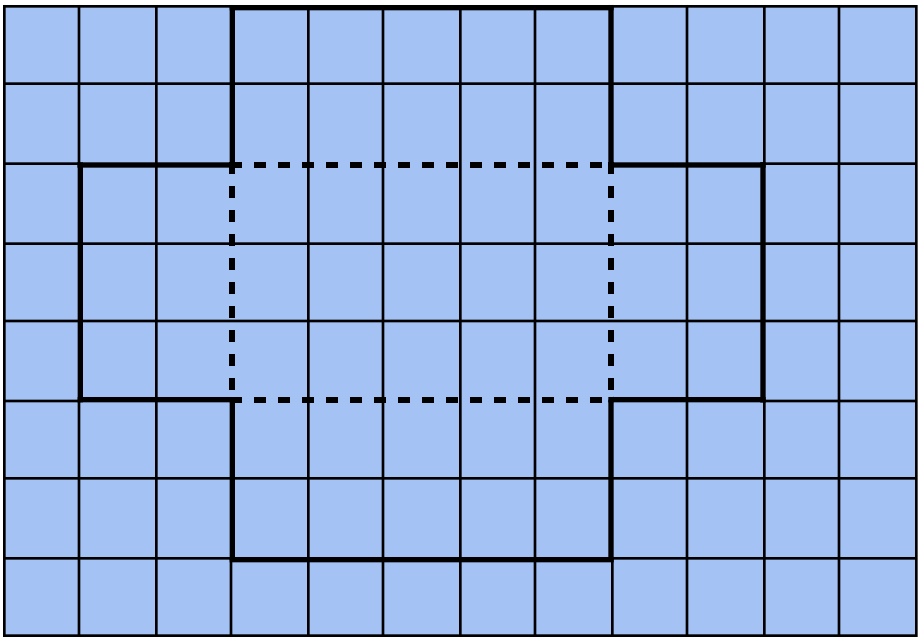
The length, breadth and height of the box are 5, 3 and 2 units.

We can keep 15 cubes to fill the base 5 × 3 = 15.

But as the height of the box is 2 units, we will need 2 layers to fill it.

Thus, 15 × 2 =30 unit cubes are required to fill the box.

Therefore, the volume of the box is 30 unit ^{3}.



We can find the volume of a cube in general by finding the number of cubes needed to fill the base of the box or finding the number of cubes to fill one layer of the base and then multiplying the area of the base by the number of layers needed to fill the box or its height.
The formula for the volume(V) of a rectangular box whose length is l, breadth b and height h units is

$V = l \times b \times h$ units^3 or area of base $\times$ height

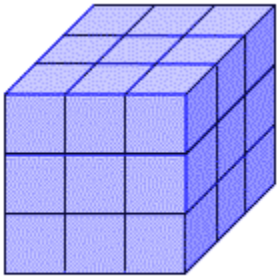
As in a cube its length, breadth and height are equal.
The formula for volume of a cube whose side is s centimetres is

$V = s \times s \times s$ units^3.

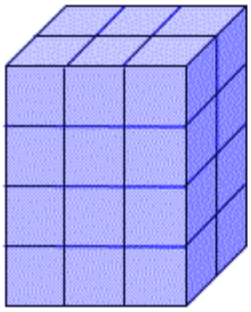
Note: The units for all dimensions length, breadth and height should be the same. You cannot take some in millimetres, others in centimetres.
The formulae hold whether the measures of length, breadth and height are whole numbers, mixed numbers or decimal numbers.

Exercise 10.3

1. Give situations in daily life where we need to find the volume.
2. Find the volume of 3 irregular objects by water displacement using a measuring cup.
3. Find the volume of cuboids made with unit cubes given below:



(a)

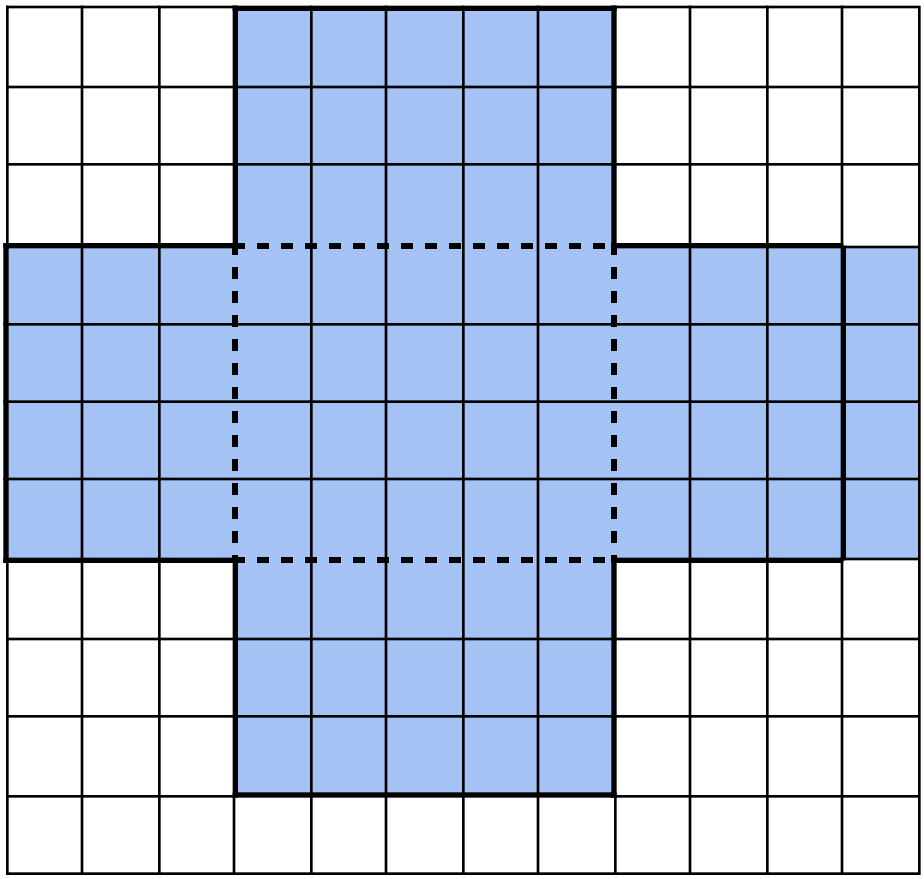


(b)

4. Measure the following amount of water with a measuring cup.
   (a) 100 ml (b) 250 ml (c) 50 ml
5. Is a cube a cuboid?
6. Find the volume of a cuboid whose area of base is 10 cm^2 and height 3 cm.
7. How many cubes with a side of 1 unit will be needed to fill a rectangular box whose length is 5 units, breadth 4 units and height 2 units?
8. A matchbox's length, breadth and height are 4 units, 2 cm and 1 cm respectively. What will be the volume of a packet containing 10 matchboxes?
9. How many soap cakes whose length, breadth and height are 7 units, 5 units and 2 units respectively can be placed in a box whose length, breadth and height are 14 units, 10 units and 6 units respectively?
10. How many different cuboids can you make using 24 different cubes of the same size? Give dimensions for all of them.

Take Home

1. Make a grid on graph paper from which an open box whose length, breadth and height are 4 units, 3 units and 2 units respectively can be made.
2. Shade the region given below on graph paper and fold the paper along dotted lines and join its edges to make a topless box. What are its length, breadth and height? How many cubes whose side is 1 unit can it hold?



UNIT 11

Collection, Organisation, Presentation, and Interpretation of Data

Collection and Organisation of data

The **data** is a set of values of attributes of an object or person that varies from object to object or person to person.

A value of an attribute may be **continuous** that is it can take all values e.g. height of a person (sometimes within a range) or it may be **categorical** e.g. sport, fruit, TV programme that has a finite number of categories.

In this class we will consider categorical data and numerical data in which the variable has values in whole numbers only.

Organising Data in a Table

Make a table like the one given below on the Blackboard.

Ask students one by one about the fruit they would prefer to have among the listed fruits for the midday meal. Write the name of the fruits and mark a tally-| for each student that names it in a table given below.

Name of the fruit	Number of students who would like to have it
Banana	
Guava	
Orange	
Apple	

(A tally | represents one student)

Call on a volunteer to count the number of tallies in each row and record the number at the end of the row.

It would make the counting easier if we record the fifth entry by a line across the first four lines (𝍸).

Call on a volunteer to redraw the tallies using the grouping notation in another table and then ask

1. Did it make it easier to count the tallies in the tally graph?
2. Why did grouping tallies make it easier?
3. What heading would you like to give to the table that will describe the data in it?

We can present a summary of this information in a similar table by writing the number of students(also called **frequency)** against fruits instead of tallies.

Table 11.1
Favourite Fruit of Students of Class 5

Name of the fruit	Number of students who favour it
Bananas	
Guava	
Orange	
Apple	
Other	

Presentation of Data

Watch the video: https://youtu.be/6omMS4zPGJMthe

Pictograph

Ask the students to draw a pictograph of the data given in Table 11.1 using a smiley face or any other picture, where a smiley face or picture represents one or more students. This is called a **key**.

Always give a key at the bottom of the pictograph.

Then ask questions for like the ones given below:

1. How many children favour bananas?
2. How many children favour guavas?
3. What is the favourite fruit of most students?
4. How is a table similar to a pictograph?
5. How is a table different from a pictograph?

Ask the class to draw a pictograph of the above data using any pictures e.g. smiley faces ( ) to represent 2 students.

1. How many children does a smiley face represent?
2. How many children prefer bananas?
3. How many children prefer guavas?
4. Which fruit is preferred by most students?
5. As the number of students in a category may not always be a multiple of 2, how would you handle that?
6. What are the advantages and disadvantages of using a smiley face to represent one student?
7. What are the advantages and disadvantages of using a smiley face to represent more than one student?

Bar graph

Watch the video: https://youtu.be/p4oOtkLvdGE

Representation of data by a pictograph is time-consuming.

Another visual presentation of data in a table is by a **Bar graph**.

To create a bar graph,

1. Draw two lines at right angles to each other.
2. Write the name of categories along the horizontal line and choose a scale for the length of the bar along the vertical scale.
3. Erect bars of uniform width vertically for each category with length equal to the number in a category. The bars should have equal spacing between them.
4. Write the name of the category below the horizontal line and name of the variable below that.
5. Write number of objects or persons along the vertical line.
6. Write the Title on the top of the Bar Graph.

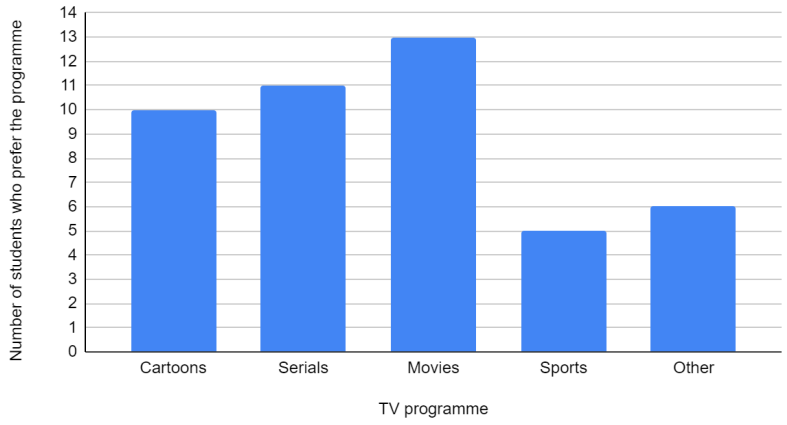
Example 1

Favourite Programme of Students of Class 5

Name of the TV Programme	Number of students who favour it
Cartoons	10
Movies	13
Serials	8
Sports	5
Other	6

A bar graph of the data on favourite TV programmes for a class given in the table is given below:

Favourite Programme of Students of Class 5



A Bar Graph enables us to read answers to questions like the ones given below:

1. How many children prefer to watch cartoons?-10
2. How many children prefer to watch sports? - 5

3. Which kind of programme is most popular? - Movies
4. Which kind of programme is least popular? - Sports
5. How many more children prefer to watch movies rather than serials? - 2
6. Do the table and bar graph provide the same information? - Yes

Line plot-A line plot is used when the data is numerical. We will consider only the case where the data is in whole numbers.

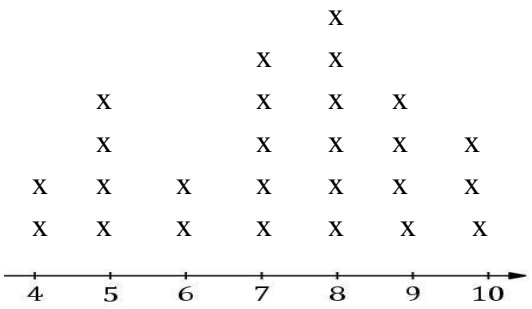
The scores of students on a Mathematics quiz were

7, 9, 6, 8, 8, 4, 10, 7, 8, 9, 5, 6, 5, 7, 10, 4, 5, 8, 9, 10, 7, 8, 5, 9, 8, 7

To make a line plot of the data

1. Draw a line.
2. Write the numerical scores students can get below the line at equal distances and scores below that. Begin with the lowest score
3. Look at each score and mark an x above the numerical score the student got, until scores of all students have been marked. For example the first score is 7, we mark an x above that, the second number is 9, mark a x over 9, and continue in this manner until the scores of all students have been marked.
4. Write the title of the line plot on top.

Scores of Students on a Mathematics Quiz



This enables us to find the answers to questions such as

(a) How many students got 5 marks or less?
(b) How many students got marks between 6 and 8?
(c) How many students got more than 8 marks?
(d) How many students took the quiz?

Exercise 11

1. The data on marks in a mathematics quiz with maximum marks of 10 is given below:

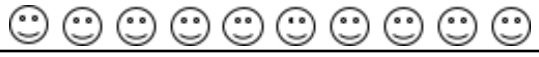
Marks	Number of students getting those marks
3	|
4	|
5	||
6	卌 |
7	卌 ||
8	卌 ||
9	||
10	|

   (a) How many students got 4 marks or less?
   (b) How many students got marks between 5 and 7?
   (c) How many students got 8 or more than 8 marks?
   (d) How many students took the quiz?
2. Draw a line plot of the table given above.
3. New coronavirus cases in the first week of July in India are given in the table given below:

Date in July	Number of new cases
1	18,653
2	19,148
3	20,903
4	22,771
5	24,850
6	22,252
7	22,752

   (a) How many new cases were reported on July 4?
   (b) How many new cases were reported from July 1 to July 3?
   (c) What trend do you notice from July 1 to July 5?
4. The following pictograph gives the number of children rounded to nearest 5 in different classes in a primary school.

Number of Children in Classes I-V in a School

Class	Number of children in different classes
I	
II	
III	
IV	
V	

= 5 children

(a) How many children does a face represent?
(b) How many children are there in class I?
(c) How many children are there in class III?
(d) Which class has the maximum number of children?
(e) Which class has the minimum number of children?
(f) Do you notice a trend as we move from class 1 to higher classes?
(g) Make a bar graph of the above data on a graph paper.

5. The data of a class about their favorite leisure time activity of students of a class is given in the Tally Chart given below:

Activity	Number of students who prefer the programme
Watch TV	𝍸 𝍸 ||
Play	𝍸 |
Hang out with friends	𝍸 |||
Read	𝍸
Other	|||

(a) How many children prefer to watch TV?
(b) How many children prefer to play?
(c) How many more children prefer to watch TV rather than play?
(d) Record this data in a table.
(e) Make a pictograph of the data given in the above table using a smiley face to represent 2 children.

(f) Make a bar graph of the above data. Does it provide the same information as a pictograph?

6. Give situations in which you will represent a smiley face or any other object to represent
   (a) 1 object or person
   (b) more than 1 object or person.

Project

The teacher may pass on small slips of paper, preferably cards to the whole class to give their responses to questions such as what is your favourite sport, what is your favourite leisure time activity, what kind of books do you like to read, and other data they may be interested in. Options may be provided, so that number of categories is not too large. Ask them to write the answers to each of these on a separate paper and collect answers to each question one at a time. The teacher may then form groups of three to four children and pass to each group data collected from all the students in the class on one question.

Ask each group to do the following:

1. Record the data in a table.
2. Write a heading for the table.
3. Write labels for all the rows and columns.
4. Mark tallies for each row beginning with the second row depending on the number of students who chose the item given in that row.
5. Make a bar graph of the above data.
6. Present the findings to the class.
7. Make a pictograph with a picture representing 1 or more objects or persons
8. Do the table, pictograph, and bar graph provide the same information?
9. Which representation of data would you prefer and why?

UNIT 12

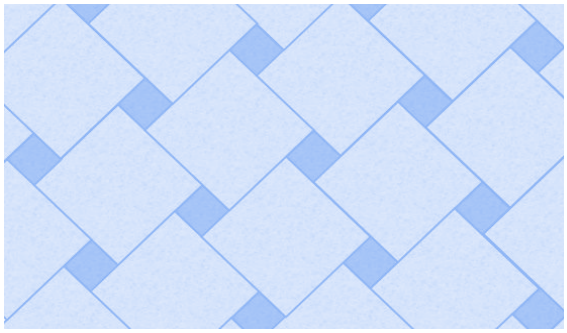
Patterns

Watch the video: **https://youtu.be/QgloWS4y1bI**

Make Border Strips and Tiling Patterns

We find patterns all around us in bed covers, cushion covers, saris, carpets, nature, etc. in our environment. Some patterns in our surroundings are given below:

A region is tiled by a shape if it covers the surface completely without leaving any holes.



We can make patterns with numbers or shapes in a number of ways:

Repeating patterns-These repeat a number of geometrical shapes, letters, numbers e.g.

…

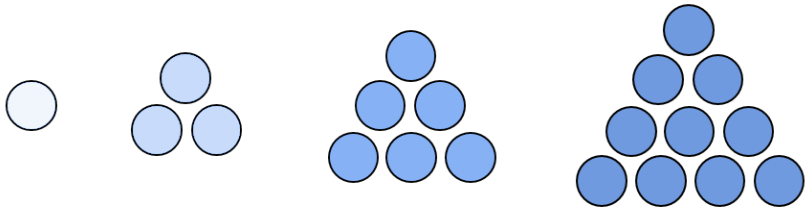
A, C, E, A, C, E, A,C, E, ...

1, 4, 5, 1, 4, 5,...

Increasing patterns-These show numbers or figures that grow in a certain manner.

We can make or continue them by adding the same number to the term just before it e.g.
3, 8, 13, 18, …
We can make or continue them by multiplying by the same number to the term just before it e.g.
1, 2, 4, 8,...

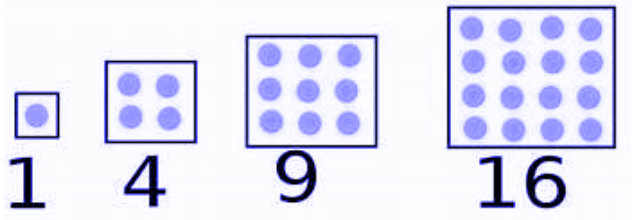
A triangular number-A triangle number is a number that is the sum of all consecutive whole numbers before it beginning with 1.
A pattern of triangular numbers is given below:



1 1+2=3, 1+2+3=6 1+2+3+4=10 …

1, 3, 6, 10, … are called triangular numbers

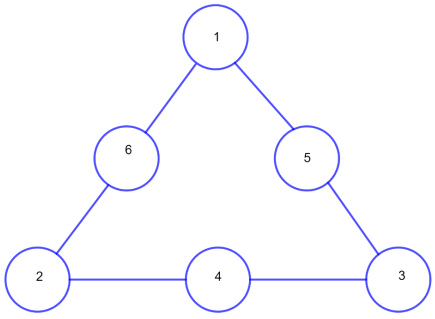
Square numbers-A square number is formed by the product of a number with itself.
A pattern can be formed by squares of consecutive numbers.



1 × 1 2 × 2 3 × 3 4 × 4 ...

1, 4, 9, 16, ... are called square numbers

Number triangles-Write the numbers 1 to 6 in circles so that each side of the triangle adds to 9.
We can write 9 as sum of three different numbers using numbers 1 to 6
9 = 4 + 3 +2
9 = 6 + 2 +1
9 = 5 + 3 +1
As 1, 2, and 3 occur twice in these combinations, we fill in those in the corners and then fill in the remaining numbers.



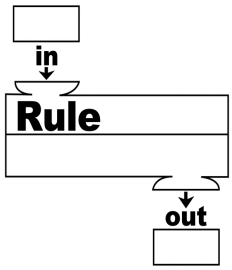
Magic Squares-A magic square has numbers such that the sum of numbers in all rows, columns, and diagonals gives the same sum called a magic number.
Fill in the cells in the square given below with numbers 1 to 9, using each number once only so the sum of the number in all rows, columns, and across diagonals is 15 given the numbers colored black.

2	7	6
9	5	1
4	3	8

The cell in the second column and first row would have a number= 15 - (5 + 3)= 7
The cell in the first column and second row would have a number= 15 - (5 + 1) = 15 - 6 = 9.
We have used numbers 1, 3, 5, 7, and 9. Only 2, 4, 6, and 8 are left.
In the first column, we need numbers whose sum is 6, so we put 2 and 4 there. (We may have to use trial and error to check where to put 2 and 4)
The number in the first row, the third column will be = 15 - (2 +7) = 6.
The number in the third row and third column will be = 15 - (1 + 6) = 8.
The numbers in the diagonals also add to 15.

Patterns in Tables

A **Function Machine** is like a computer. If you enter an input and a rule in it, it gives an output.



We can make a table of inputs and outputs.
For example, if we input 1, 2, 3, 4, … and the rule Output = 2×Input + 3, we will get the following outputs for different numbers.

Input	Output
1	5
2	7
3	9
4	11

Can you tell what would be the outputs for the inputs given below following the rule in the above table:
(a) 5 (b) 8
Similarly, if we are given a table of Inputs and Outputs given according to a rule, we can find the rule by looking at inputs and outputs.
Example 1

Input	Output
1	2
2	4
3	6
6	12

Can you find the rule?
Output = 2×Input

Exercise 12

Activity 1

Find some patterns in your surroundings and describe these in the class.

Activity 2

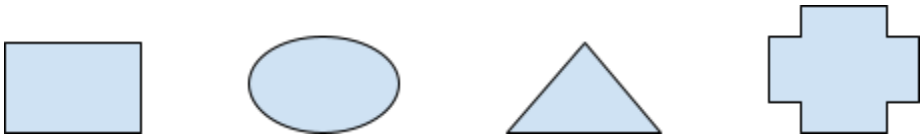
Take some tangram pieces or coins and make patterns by tracing around them and describe these in the class**.**

Activity 3

Make some patterns with pattern blocks, toothpicks or popsicles.

Activity 4

Draw and cut the figures given below and paste them on a cardboard and tile a region with it by tracing around the figure. If you were not able to tile a region with some of them, name them.

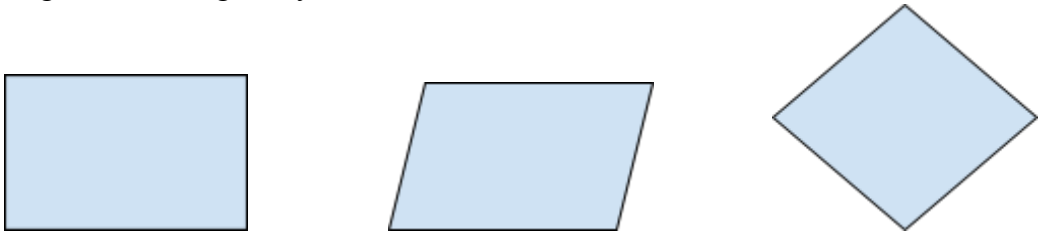


Activity 5

1. Write the first nine multiples of 3 and find the sum of digits of each multiple, what do you notice?
2. Does the rule hold for multiples of 3 greater than 9? If not, give a counterexample. (If the sum of the digits is a two or more digit number then sum those digits again.)
3. Find the first nine multiples of 9 and find the sum of digits of each multiple, what do you notice? (If the sum of the digits is a two or more digit number then sum those digits again.)
4. Does the rule hold for multiples of 9 greater than 9? If not, give a counterexample

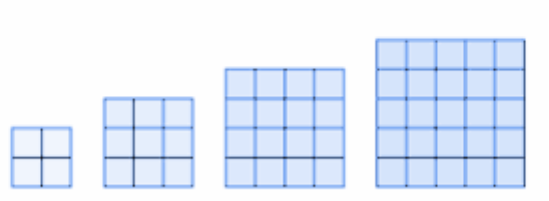
Activity 6

Trace each of the figures given below and cut a curve on one side of the figure. Paste the figure on cardboard and paste the cut part to the side opposite to the side from which it was cut and cut it again. Tile a region by it.

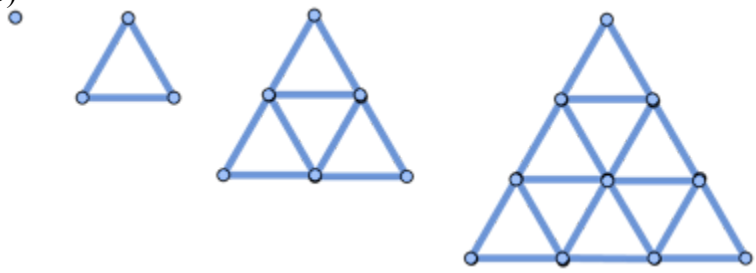


1. Draw the next figure.

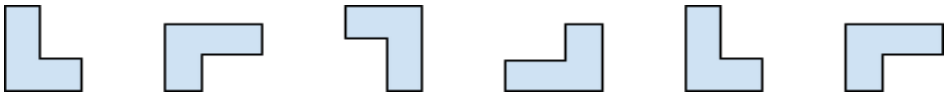
   (a)



   (b)



2. Identify the pattern in the figures drawn below and use the pattern to draw the next two figures.



3. Identify a rule in writing the numbers given below. State the rule and write the next term.
   (a) 3, 5, 7, 9, ____
   (b) 41, 37, 33, 29, ____
   (c) 3, 9, 27, 81,____
   (d) 32, 16, 8, 4, ____
   (e) 1, 4, 9, 16, ____
   (f) 1, 3, 6, 10, ____
   (g) 1, 1, 2, 3, 5, 8, ____
4. Look at the pattern in the following sums
   $1 + 3 = 4 = (2 \times 2)$
   $1 + 3 + 5 = 9 = (3 \times 3)$
   $1 + 3 + 5 + 7 = 16 = (4 \times 4)$
   $1 + 3 + 5 + 7 + 9 = 25 = (5 \times 5)$
   Using the pattern find the sums given below:
   (a) 1 + 3 + 5 + 7 + 9 + 11
   (b) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17
   (c) What kind of numbers are the sums?
5. Look at the patterns in the following sums:

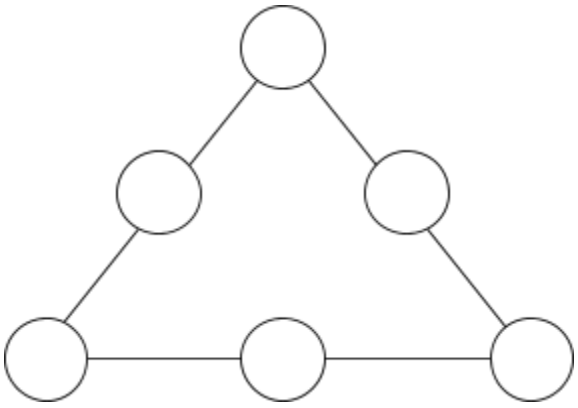
$1 + 2 = 3$
$1 + 2 + 3 = 6$
$1 + 2 + 3 + 4 = 10$
$1 + 2 + 3 + 4 + 5 = 15$
Using the pattern find mentally the sums given below:
(a) $1 + 2 + 3 + 4 + 5 + 6$
(b) $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$
(c) What kind of numbers are these?

6. Complete the multiplications below:

$5 \times 5 =$	$4 \times 6 =$
$3 \times 3 =$	$2 \times 4 =$
$6 \times 6 =$	$5 \times 7 =$
$8 \times 8 =$	$7 \times 9 =$

What relation do you notice between the numbers and products in each row? Use the relation to find mentally
(a) If $24 \times 24 = 576$, find 23×25.
(b) If $37 \times 37 = 1369$, find 36×38.
(c) Find 19×21.
(d) Find 29×31.

7. Write the numbers 1 to 6 in circles so that each side of the triangle adds to 10.



8. Fill in the blank cells so that all rows, columns, and diagonals add to magic number 12.

		5
	4	6

9. Fill in the blank cells so that all rows, columns, and diagonals add to magic number 18

	4	
	8	3

10. A function machine gives the output for input according to a rule. Guess the rule for the tables given below and write the output for the remaining inputs.

(a)

Input	Output
2	5
3	6
4	7
8	

(b)

Input	Output
8	6
9	7
10	8
14	

(c)

Input	Output
1	4
2	8
3	12
7	

(d)

Input	Output
3	1
6	2
9	3
12	4
24	

(e)

Input	Output
1	3
2	5
3	7
4	9
5	

11. Use the rule-Output = 5× Input to find the outputs for the inputs given in the table.

Input	Output
1	
2	
3	
6	

12. Use the rule-Output = 2× Input + 3 to find the outputs for the inputs given in the table.

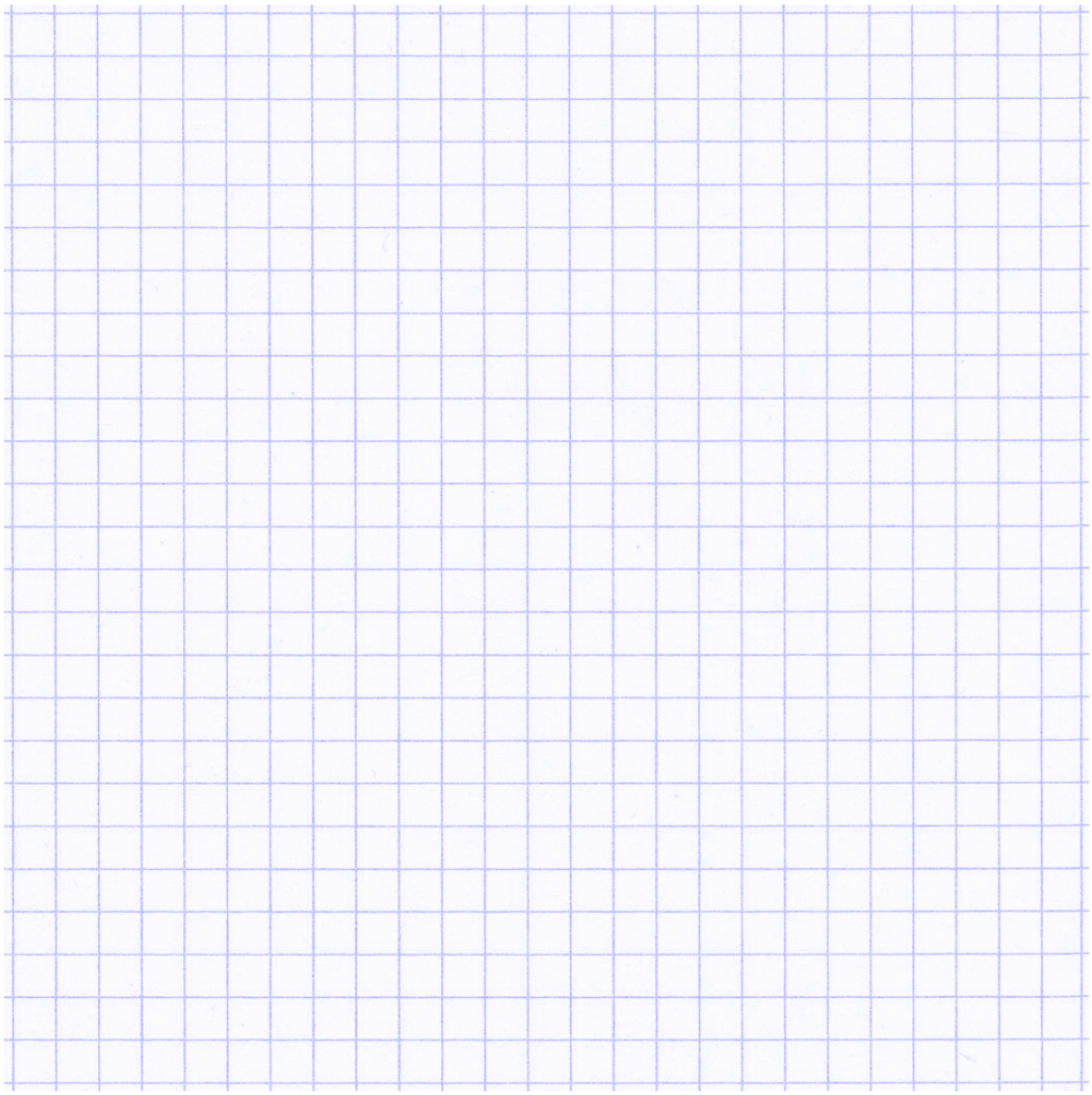
Input	Output
1	
2	
3	
6	

13. Use the rule-Output = 3× Input -1 to find the outputs for the inputs given in the table.

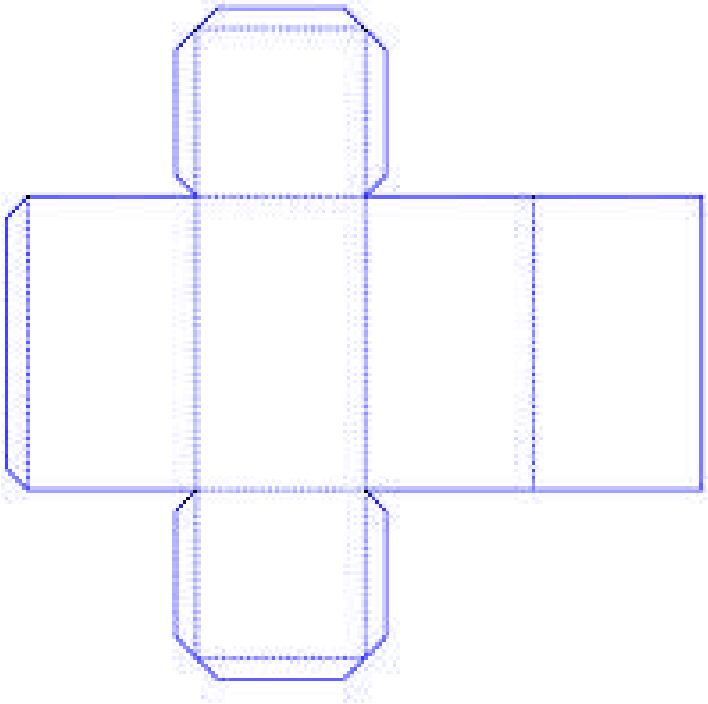
Input	Output
1	
2	
3	
6	

ACTIVITY SHEETS

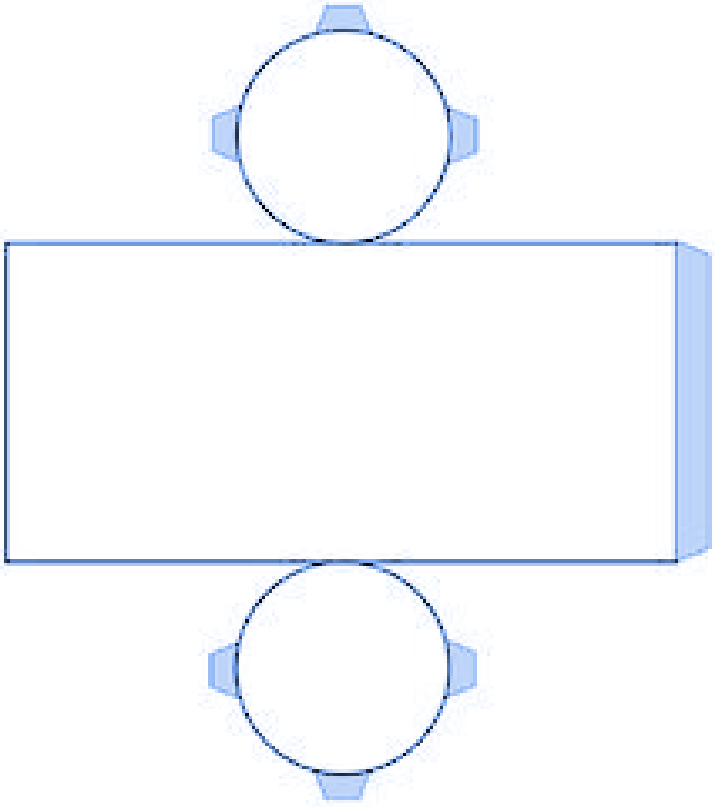
Activity Sheet 4.1-Graph Paper



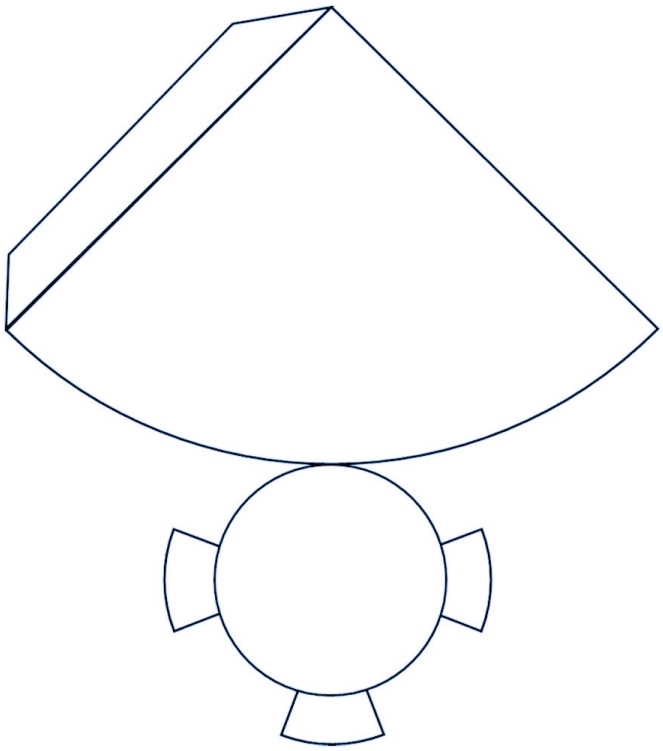
Activity Sheet 8.1-Net for a cuboid



Activity Sheet 8.2-Net for a cylinder

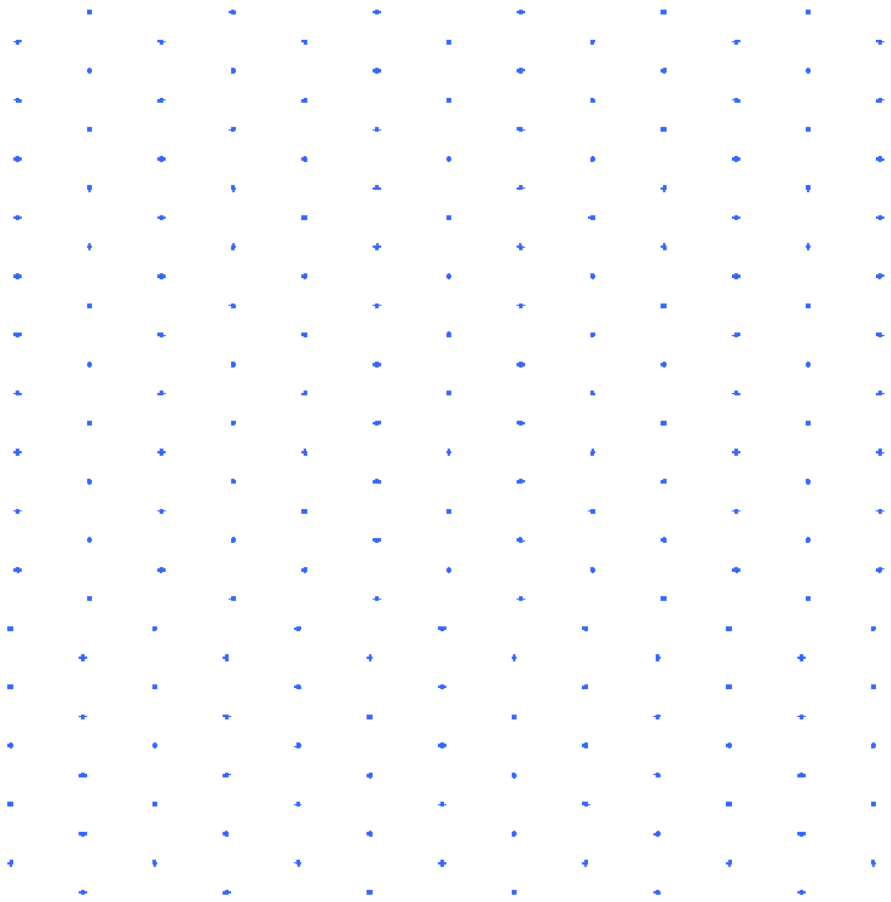


Activity Sheet 8.3-Net for a Cone

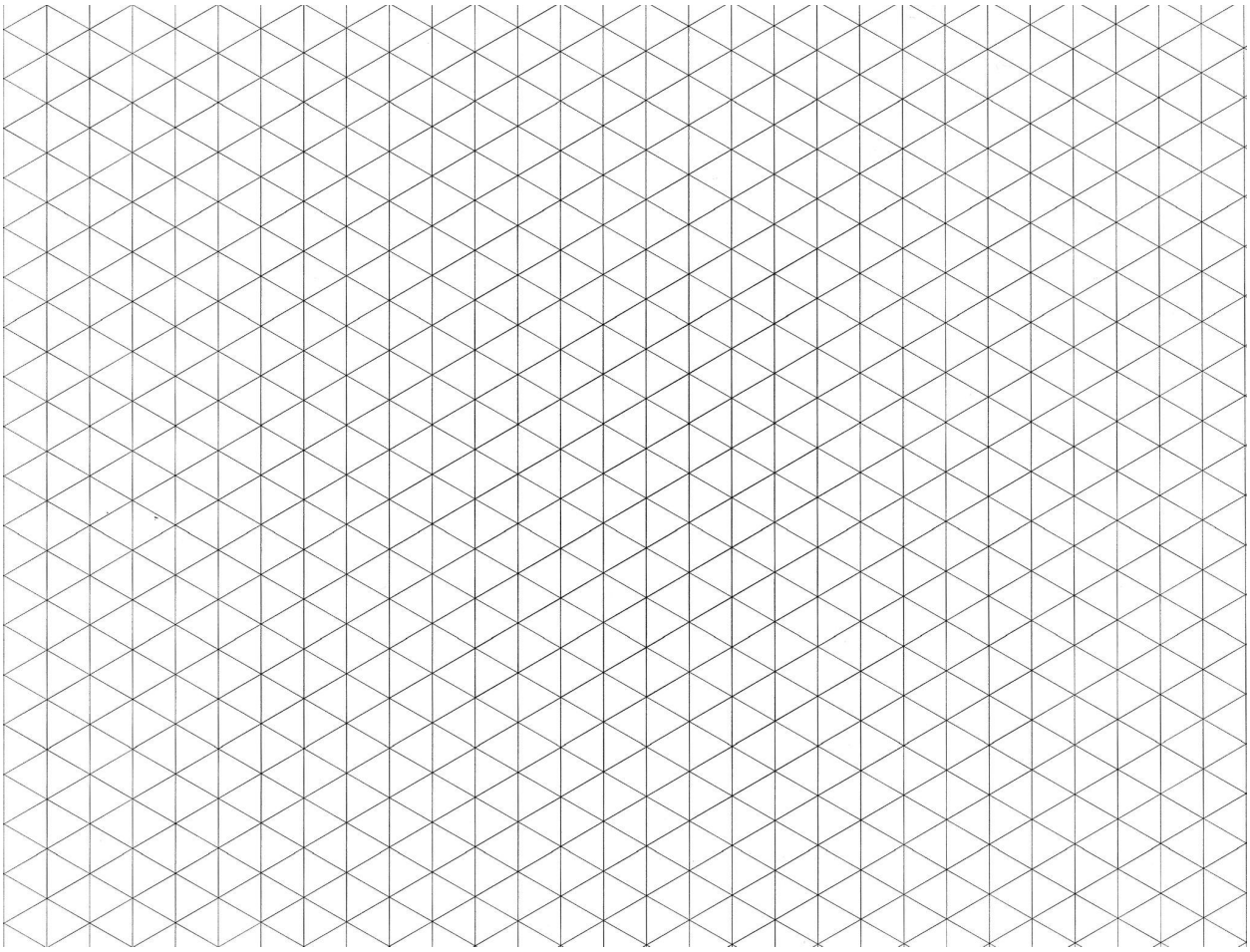


Activity Sheet 8.4-Isometric Dot Paper

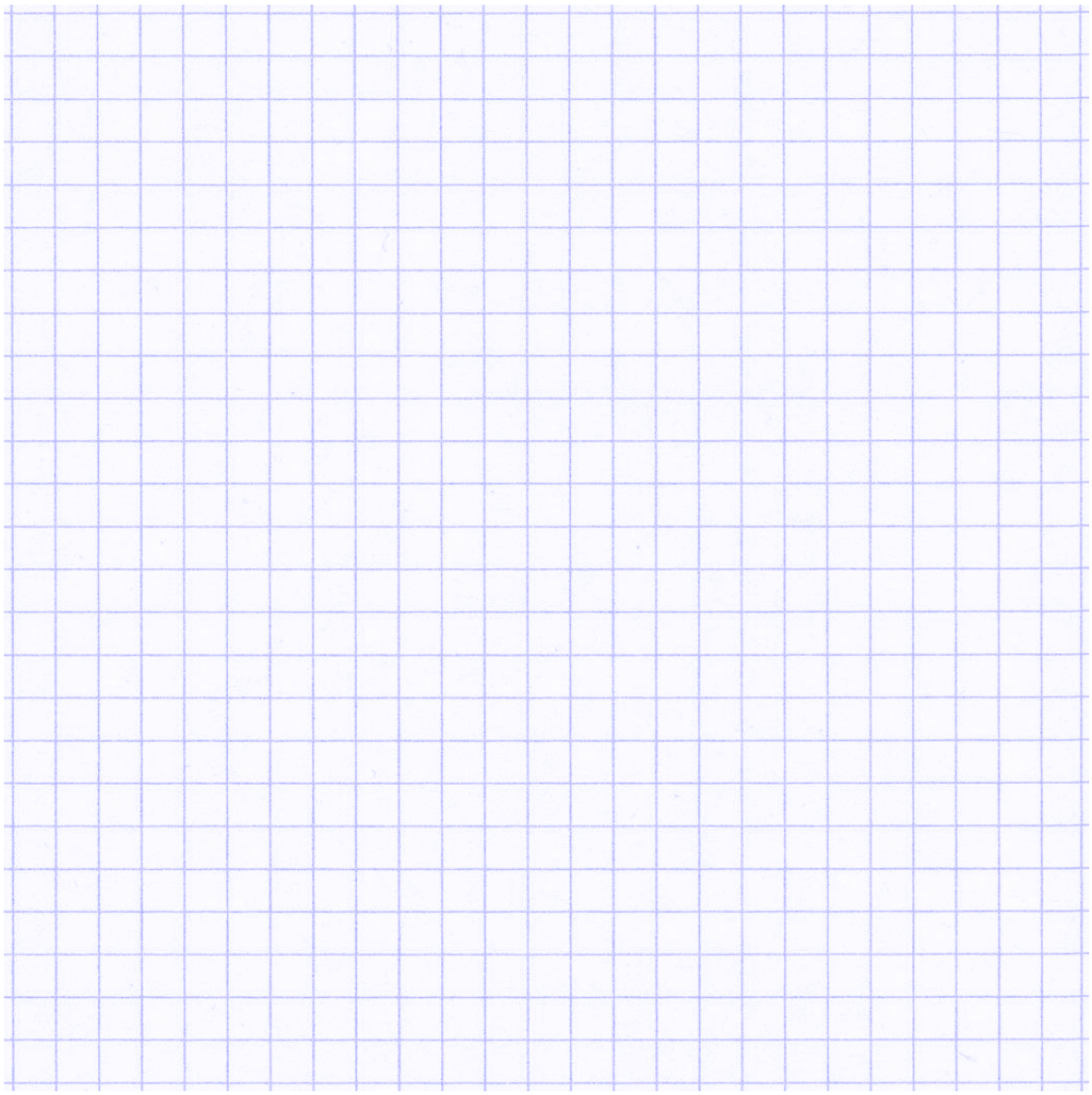
Isometric Dot Paper



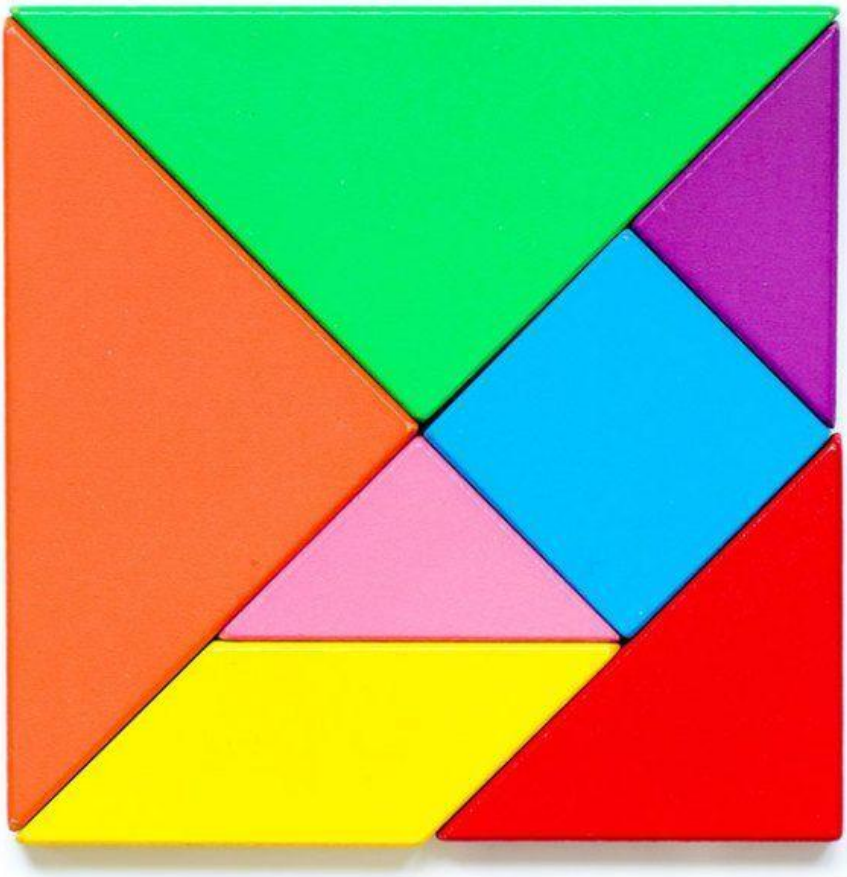
Activity Sheet 8.5-Isometric Graph Paper



Activity Sheet 10.1-Graph Paper



Activity Sheet 10.2-Tangram



ANSWERS TO SELECTED EXERCISES

Exercise 1.1

13 As a digit shifts one place to its left, its place value is multiplied by 10.
14. 3,54,843 15. 3,25,924 19. 8,542 20. 24,589
21. 249, 294, 429, 492, 924, 942 22. The answers will vary

Exercise 1.2

9. 65 - 70 10. 350 - 399 11. 5500 - 5999

Exercise 2.1

1. (a) 72 (b)1 (c) Number itself (d) 0
2. (a) 7 (b) 6 (c) 2 (d) 7
   (e) 6 (f) 4 (g) 6 (h) 4
4. They are equal. 5. 43,368.
6. (a) $5 \times 83 \times 2 = 83 \times 5 \times 2 = 830$ (b) $19 \times 9 = (20 - 1) \times 9 = 171$
   (c) $35 \times 6 = (30 + 5) \times 6 = 186$ (d) $25 \times 7 \times 4 = 25 \times 4 \times 7 = 700$
7. (a) 35, 42 (b) 16, 32 (c) 25, 36
8. (a) 1200, 1334 (b) 4000, 4074 (c) 3000, 3162 (d) 90,000, 88486
9. (a) 1,85,472 (b) 5,15,745 (c) 81,480? (d) 6,08,172
   (e) 5,59,062 (f) 1,79,000 (g) 2,66,304 (h) 3,41,040
10. Rs.4150 11. Rs108, Rs.12 12.Rs. 520 13. 120
14. 2880 eggs.

Exercise 2.2

1. (a) 853 (b) 6 (c) 1 (d) Correct
2. (a) 23 (b) 0 (c) 1
3. (a) 2, 1 (b) 10, 1
4. (a) 70 (b) 160 (c) 160 (d) 160
5. (a) 500 (b) 400 (c) 1500 (d) 1800 (e) 1500
8. 9 9. 1350 10. (a) 8 notebooks (b) Rs.64 (c) Rs.6
11. 2 taxis 12. 30 children 13. 5 litres
14. (a) we need to know how much money he gave to the shopkeeper (b) 4
    (c) We need to know how many children can be seated in a minivan. (d) 1128 pearls
15. Answers will vary. 16. 70 17. any number

Exercise 3

7. (a) 1, the number itself (b) 1 (c) even (d) 2
8. (a) 2, 4, 6, 8, 0
   (b) 1, 3, 5, 7, 9
   (c) 5, 0
   (d) 10
9. 6, 20, 64 10. 1, 63, 57, 91
11. (a) No (b) Yes (c) Yes
12. (a) 21, 45, 53 because they are odd numbers.
    (b) 43 and 67 because the number in one's place is not 0 or 5
    (c) 45, 51 and 67 because 2 a factor of 6 is not a factor of these.

13. 30, 60, and 90, All these numbers are multiples of 5 and 6.
16. Yes
17. No, 4 is a factor of 12 but its multiple 8 is not a factor of 12.
18. (a) 1, 2, 4, 8, 16
    (b) 1, 2, 3, 5, 6, 10, 15, 30
    (c) 1, 2, 3, 4, 6, 8, 12, 24
    (d) 1, 2, 4, 5, 8, 10, 20, 40

Exercise 4

1. (a) $\frac{2}{3}$ (b) $\frac{3}{7}$ (c) $\frac{5}{7}$ (d) $\frac{1}{3}$ (e) $\frac{1}{2}$ (f) $\frac{2}{4}$
2. (a) $\frac{1}{2}$ *and* $\frac{1}{3}$ (b) $\frac{2}{3}, \frac{1}{3}$ *and* $\frac{3}{7}, \frac{5}{7}$ (c) $\frac{1}{2}$ *and* $\frac{2}{4}$
3. (a) $\frac{3}{4}$ (b) $\frac{5}{8}$ (c) $\frac{1}{2}$ (d) $\frac{2}{4}$ (e) $\frac{3}{6}$ (f) $\frac{5}{6}$
   (g) $\frac{4}{9}$ (h) $\frac{1}{6}$ (i) $\frac{1}{2}$ (j) $\frac{3}{8}$ (k) $\frac{2}{5}$ (l) $\frac{1}{2}$
4. $\frac{4}{10}$ *or* $\frac{2}{5}$ 5. (a) 12 (b) 3 (c) 6 (d) 2 (e) 6
   (f) 15 (g) 6 (h) 28 6. (a) $\frac{2}{4}$ (b)$\frac{3}{7}$ (c) $\frac{5}{6}$
7. (a) < (b) > (c) > (d) < (e) > (f) =
   (g) > (h) < 8. (a) 2 (b) $\frac{1}{2}$ (c) 3 (d) $\frac{1}{3}$
   (e) 6 (f) $\frac{1}{6}$ (g) 2 (h) $\frac{1}{2}$ 9. $\frac{7}{8}$
11. (a) $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}$ (b) $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}$ (c) $\frac{1}{6}, \frac{1}{5}, \frac{1}{2}$
12 (a) $\frac{3}{4}, \frac{3}{6}, \frac{3}{7}$ (b) $\frac{2}{3}, \frac{2}{5}, \frac{2}{8}$ (c) $\frac{2}{7}, \frac{2}{3}, \frac{2}{5}$
13. (a) $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}$ (b) $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}$ (c) $\frac{2}{3}, \frac{4}{6}, \frac{6}{9}$
14 (a) $\frac{2}{3}, \frac{3}{5}, \frac{4}{15}$ (b) $\frac{7}{8}, \frac{3}{4}, \frac{1}{2}$ (c) $\frac{5}{6}, \frac{3}{4}, \frac{7}{12}$
18. (a) $1\frac{2}{8}$ (b) $1\frac{2}{3}$ 19. (a) $\frac{13}{7}$ (b) $\frac{15}{4}$
22. Rs.10 23. 15 m, 5m. 24. Food
25. $\frac{3}{8}$of the melon 26. $1\frac{1}{2}$ piece 27. 12 cherries

Exercise 5.1

1. (a) 1.2 (b) 2.0 (c) 0.6 (d) 0.5
2. (a) 4 tenths (b) 1 unit and 8 tenths (c) 2 units (d) 3 units and 9 tenths
   (e) 24 units and 9 tenths 4. (a) 0.5 (b) 1.6 (c) 10.4
5. (a) 12 (b) 3 (c) 6 (d) 2 (e) 6 (f) 15 (g) 6 (h) 28
6. (a) $\frac{7}{10}$ (b) $1\frac{4}{10}$ (c) $2\frac{3}{10}$ (d) 5 (e) $10\frac{3}{10}$
7. (a) 0.3 (b) 2.6 (c) 3.9 (d) 0.4

Exercise 5.2

2. (a) 0.5 (b) 2.7 (c) 13.6 (d) 0.62
   (e)10.4 (f) 0.64 (g) 0.40 (h) 0.03
3. (a) Eight tenths (b) Seven and six tenths

(c) Eight (d) Fifteen and nine tenths
(e) Seventy six and eight tenths (f) Seventy eight hundredths or 7 tenths and 8 hundredths
(g) Eight and forty five hundredths (h) Nine and fifty hundredths or nine and 5 tenths
(i) Forty five and seven hundredths (j) Four hundredths

4. (a) 0.7 (b) 5.6 (c) 10.9 (d) 4.6 (e) 2.5
(f) 0.73 (g) 4.56 (h) 0.50 (i) 74.67 (j) 0.08

5. (a) $\frac{4}{10}$ (b) $2\frac{7}{10}$ (c) $3\frac{5}{10}$ (d) $6\frac{2}{10}$
(e) $\frac{49}{100}$ (f) $6\frac{78}{100}$ (g) $7\frac{50}{100}$ (h) $23\frac{3}{100}$

6. (a) 0.37 (b) 1.4 (c) 1.25 (d) 0.07

7. (a) 70 (b) 46 (c) 30

8. (a) 0.5 (b) 0.7 (c) 2 9. (a) 0.42 (b) 0.67 (c) 1.59

10. (a) > (b) < (c) =
(d) > (e) < (f) >

11 (a) 0.34, 0.6, 0.65 (b) 0.46, 0.5, 0.78 (c) 0.28, 0.7, 1.5

12. (a) 0.6, 0.54, 0.47 (b) 0.3, 0.07, 0.03 (c) 2.7, 1.78, 0.96, 0.5

13. (a) 1.42 = 1 ones + 4 tenths + 2 hundredths

$= 1 \times 1 + 4 \times \frac{1}{10} + 2 \times \frac{1}{100}$

(b) 0.57 = 0 ones + 5 tenths + 7 hundredths or 5 tenths + 7 hundredths

$= 0 \times 1 + 5 \times \frac{1}{10} + 7 \times \frac{1}{100}$ or $5 \times \frac{1}{10} + 7 \times \frac{1}{100}$

(c) 2.70 = 2 ones + 7 tenths

$= 2 \times 1 + 7 \times \frac{1}{10}$

(d) 2.05 = 2 ones + 0 tenths + 5 hundredths or 2 ones and 5 hundredths

$= 2 \times 1 + 0 \times \frac{1}{10} + 5 \times \frac{1}{100}$ or $2 \times 1 + 5 \times \frac{1}{100}$

(e) 0.60 = 0 ones + 6 tenths + 0 hundredths or 6 tenths

$= 0 \times 1 + 6 \times \frac{1}{10} + 0 \times \frac{1}{100}$ or $6 \times \frac{1}{10}$

(f) 0.05 = 0 ones + 0 tenths + 5 hundredths or 5 hundredths

$= 0 \times 1 + 0 \times \frac{1}{10} + 5 \times \frac{1}{100}$ or $5 \times \frac{1}{10}$

14. (a) 4.32 (b) 0.57 (c) 2.7 (d) 0.6 (e) 0.08

15. (a) 4 (b) 0.5 or $\frac{5}{10}$ (c) 0.08 *or* $\frac{8}{100}$ (d) 0.0 or $\frac{2}{10}$ (e) 0.06 or $\frac{6}{100}$

16. (a) tens (b) tenths (c) hundredths (d) Thousands (e) tenths

17. (a) 3 (b) 38 (c) 3 (d) 2 (e) 1

18. (a) 7.4 (b) 37.6 (c) 6.5 (d) 1.2 (e) 235.7 (f) 0.1

Exercise 5.3

1. (a) 3.5 cm (b) 0.6 cm 2. (a) 2.34 cm (b) 0.54 cm (c) 3.55 cm (d) 7.2 cm

3. (a) 3 units and 4 mm (b) 5m and 84 cm (c) 4 m and 50 cm (d) 7 cm and 2 mm

4.100 paise 5.(a) Rs.4 (b) Rs.6 (c) Rs. 1, 25 Rs. 4.70

6. (a) 500 paise (b) 140 paise (c) 660 paise

7. (a) Rs. 3.35 (b) Rs. 7.50 (c) Rs. 7.05

Exercise 6.1

1. (a) Rs.3.35 (b) Rs. 7.50 (c) Rs. 4.05
2. (a) Rs. 46 (b) Rs.19 (c) Rs. 105
3. (a) Rs. 3 (b) Rs. 24
4. (a) Rs. 240 (b) Rs. 24 (c) Rs. 12
5. (a) Rs. 80 (b) Rs. 5
6. (a) Rs. 32 (b) Rs. 8 (c) Rs. 4

Exercise 6.2

1. (a) Rs. 13.50 (b) Rs. 15 (c) Profit (d) Rs. 1.50 (e) Rs. 750
2. A loss of Rs. 150 3. By subtracting profit from S.P. 4. By adding profit to C.P.
6. By adding loss to S.P.
7.

Cost Price	Selling Price	Profit
Rs 5.50	Rs.6	**Rs. 0.50**
Rs. 15	**Rs. 16.20**	Rs.1.20
Rs. **2650**	Rs. 3000	Rs.350

8.

Cost Price.	Selling Price.	Loss
Rs 100	Rs.90	**Rs. 10**
Rs. 1500	**Rs. 1380**	Rs.120
Rs. 1850	Rs. 1500	Rs.350

9. Rs. 14 10. Rs. 2,15,000

Exercise 7.1

1. clockwise 2. Anticlockwise or counterclockwise 3. 1 minute
4. 5 minutes 5. 60 minutes 6. 1 hour
7. (a) 7:20 (b) 4:40 (c) 12 o'clock (d) 10:12 (e) 7:15 (f) 9:15
8. (a) 10 minutes past 4 (b) half past 5 (c) quarter to 9 (d) 10 minutes to 5
9. (a) 4 & 12 (b) 5 & 6 (c) 8 & 9 (d) 4 & 2 dots after 6
10. (a) a.m. (b) p.m. (c) p.m. (d) a.m.
11. (a) a.m. (b) a.m. (c) p.m. (d) p.m.
12. (a) 4:30 (b) 7 o'clock (c) 3:45 (d) 10:03
13. (a) 9:45 (b) 2:15 (c) 3 o'clock (d) 10:28
14. (a) 5:40 a.m.(b) 5:20 p.m. (c) 9:55 (d) 12:30 p.m.
15. $9\frac{1}{2}$ hours or 9 hours and 30 minutes 16. 27 minutes12. 17. 1 hour 21 minutes
18. 8:15 p.m.

Exercise 7.2

1. (a) 7 2.(a) 12 3. (a) 31 (b) 31 (c) 30 5. 9 6. Sunday

8. 8 days 9. 25 10. 2 nd Jan next year

Exercise 8.1

5. (a) Line (b) Line segment (c) Ray

6. (a) AB, BC, CA (b) AB, BC, CD, DA (c) AB, BC, CD, DE, EA

7. A line segment is part of a line between two points, whereas a line extends on and on in both directions.

8. A ray is part of a line that starts at a fixed point and extends on and on in one direction, whereas a line extends on and on in both directions.

9. A line segment is a part of line between two points, whereas a ray is a line that starts at a fixed point and extends on and on in a direction beginning from that point.

Exercise 8.2

4. C 5. B

7. (a) acute (b) right (c) obtuse

8. (a) acute (b) obtuse (c) right

9. right angle or 90 $^{\circ}$ 10. Straight or 180 $^{\circ}$

11. (a) right angle or 90 $^{\circ}$ (b) straight or 180 $^{\circ}$ (c) 0 $^{\circ}$

12. $\angle$CAB, $\angle$ ABD, $\angle$BDC, $\angle$DCA; all of them are right angles.

13. $\angle$CAB, $\angle$ ABC, $\angle$BCA, all of them are acute

Exercise 8.3

1. All of them except fish

7. All of them except clock, leaf and arrow

7. (b) 6, 6 (c) 3,3 (d) infinite, infinite (e) 6, 6

8. (b) 2, 2 (c) 0,0 (d) 1, 0 (e) 1,0

Exercise 9.1

1. 1,000 g 2. (a) 2,000 g (b) 500 g (c) 250 g (d) 1250 g (e) 3050 g

3. (a) kg (b) g (c) g (d) kg 5. (a) Rs. 4 (b) Rs. 8

(c) Rs. 30 6. (a) 2 (b) 4 (c) $\frac{3}{4}$

7. (a) Rs. 50 (b) Rs, 150 (c) Rs, 25 (d) Rs. 12.50

8. (a) 400 g (b) 300 g (c) 1 kg and 200 g

Exercise 9.2

2. Fill container-1 with water and pour it into container-2. until it is full.
   If some water is left in it after filling the container-2, container-1 has more capacity.
   If container-1 could not fill the container-2 fully, container-2 has more capacity.
   If container-2 was filled completely and no water was left in container-1, both containers have equal capacity.

3, l and ml 4. 1000 ml 7. (a) 250 ml (b) 500 ml (c) 3000 ml

8. (a) ml (b) l (c) ml (d) ml 9. 200ml or C

10. (a) 500 ml (b) 100 ml + 50 ml (c) 1l + 500 ml (d) 200 ml + 100 ml + 50 ml

11. (a) Rs 100 (b) Rs. 5

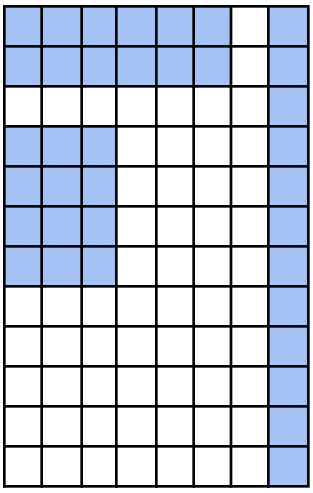
12. (a) Fill in the 8-litre container and pour it into a 5 litre-container. Three litres will be left in the 8-litre container.
(b) Fill in the 5-litre container and pour it into the 8 litre-container. Fill it again. there will be 10 litres of water in both the containers.
(c) Fill in the 5-litre container and pour it into the 8 litre-container. Fill it again and pour it into the 8-litre container until it is full. Two litres will be left in the 5-litre container.

Exercise 10.1

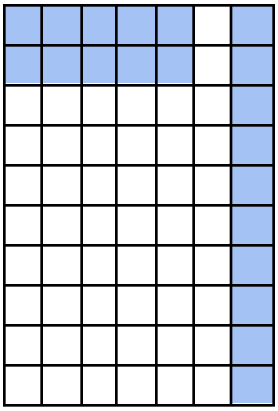
2. (a) 8 (b) 10 (c) 16 (d) 12
5. (a) 8 (b) 4×4 (c) 5 ×2 (d) 2×1
7. (a) 500 m (b) 2000 m 8. 5 metres
9. (a) 17 cm (b) 20 cm

Exercise 10.2

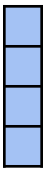
2. (a) 12 (b) 9 (c) 5 (d) 3 (e) 26
3. (a)



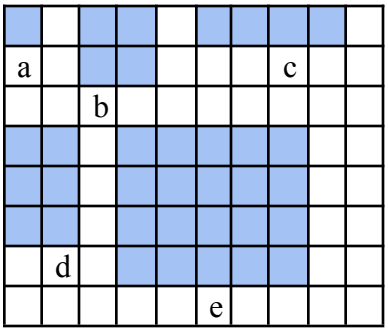
(b)



(c)



4. (a)12 unit ^{2} (b) 10 unit ^{2} 5. (a) 16 unit ^{2} (b) 9 unit ^{2} (c) 6.30 cm ^{3}
6. 17. 5 unit ^{2} (b) 26 unit ^{2} (c) 23 unit ^{3} 7. (a) No (b) Yes
8.



9. Make a rectangle with length equal to 6 square pieces and width equal to 5 square pieces.
10. 500 tiles

Exercise 10.3

3. (a) 27 (b) 24 5. Yes 6. 200 ml 7. 40
8. 80 cm ^{3} 9. 12

Exercise 11

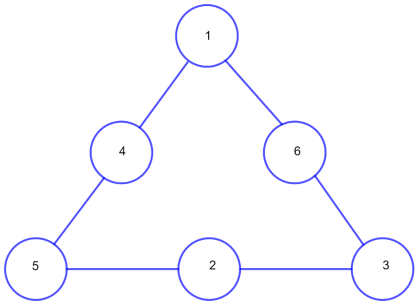
1. (a) 4 (b) 20 (c) 3 (d) 27
3. (a) 22,771 (b) 58,704 (c) Number of cases increased each day.
4. (a) 5 (b) 50 (c) 40 (d) I (e) IV and V

Exercise 12

3. (a) Add 2 to the previous term beginning with 3, 11.
   (b) Subtract 4 the previous term beginning with 41, 25.
   (c) Multiply by 3 the previous term beginning with 3, 243.
   (d) Divide by 2 the previous term beginning with 32, 2
   (e) Square the next number beginning with 1, 25.
   (f) Add 1 more than the number added to get the previous term, 15
   (g) Sum of the last two terms beginning with third term,13.
4. (a) 6×6 (b) 9×9
5. (a) 21 (b) 36 (c) Triangular

6. (a) For the square of a number, if one number increases by 1 and the other decreases by 1, the product is 1 less than the square of the number.
   (b) 575 (c) 1368 (d) 399 (e) 899

7.



8.

7	**0**	5
2	4	6
3	**8**	1

9.

9	4	5
2	6	10
7	8	3

10. (a) Output = Input + 3, 11
    (b) Output = Input - 2, 12
    (c) Output = 4×Input
    (d) Output = Input3
    (e) Output = 2Input + 1

11. 5, 10, 15, 30 12. 3, 5, 7, 9, 15 13. 2, 5, 8, 17

APPENDICES

APPENDIX 1-100 Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

APPENDIX 2-Multiplication Table

×	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

APPENDIX-3 Mastery Test in Multiplication Facts

6 × 3	2 × 6	4 × 4
5 × 4	7 × 5	5 × 9
4 × 2	4 × 7	7 × 8
3 × 7	9 × 1	2 × 9
4 × 6	2 × 5	5 × 9
3 × 8	3 × 4	9 × 6
3 × 3	5 × 6	8 × 8
7 × 0	9 × 7	9 × 9
6 × 7	6 × 6	8 × 9
5 × 5	2 × 7	4 ×8
2 × 2	4 × 9	6 ×8
3 × 9	2 × 8	7 ×7
5 × 3	8 × 5	0 ×0

APPENDIX 4-Mastery Test on Division Facts

6 ÷ 2	30 ÷ 6	15 ÷ 5
12 ÷ 4	8 ÷ 2	24 ÷ 8
10 ÷ 5	21 ÷ 3	63 ÷ 7
20 ÷ 5	20 ÷ 5	6 ÷ 3
12 ÷ 6	12 ÷ 3	28 ÷ 4
12 ÷ 2	10 ÷ 2	28 ÷ 7
14 ÷ 7	14 ÷ 2	36 ÷ 9
30 ÷ 5	25 ÷ 5	8÷ 1
8 ÷ 8	16 ÷ 4	35 ÷ 5
18 ÷ 9	24 ÷ 3	48 ÷ 6
0 ÷ 3	36 ÷ 4	6 ÷ 1
21 ÷ 7	32 ÷ 8	72 ÷ 9
24 ÷ 4	42 ÷ 6	56 ÷ 8
36 ÷ 6	45 ÷ 5	40 ÷ 8
40 ÷ 5	42 ÷ 7	63 ÷ 9
4 ÷ 2	16 ÷ 2	49 ÷ 7
18 ÷ 6	48 ÷ 8	54 ÷ 6
15 ÷ 3	56 ÷ 7	81 ÷ 9
32 ÷ 4	45 ÷ 9	54 ÷ 9
35 ÷ 7	49 ÷ 7	72 ÷ 9
16 ÷ 8	9 ÷ 3	18 ÷ 3
27 ÷ 91	8 ÷ 4	24 ÷ 6
5 ÷ 5	18 ÷ 2	
20 ÷ 4	27 ÷ 3	